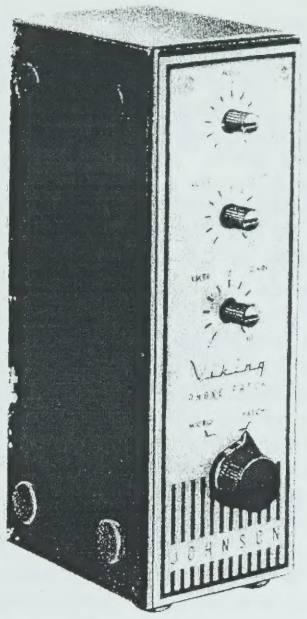
VIKING PHONE PATCH

CATALOG NO. 250-46

design file

INSTALLATION AND OPERATING INSTRUCTIONS



GENERAL DESCRIPTION

The Johnson Viking Phone Patch is a device which may be used to connect a telephone circuit into any communication installation. It utilizes a hybrid transformer bridge circuit which will automatically transfer a signal from the station receiver into the phone line or a signal from the phone line into the station transmitter for rebroadcasting. The hybrid circuit provides a high degree of isolation between the receiver output and the transmitter input circuits thus making it an ideal unit for use in voice operated installations. It incorporates separate receiver and transmitter gain controls which eliminate the need for re-adjusting the gain controls on the station transmitter and receiver when going from normal operation to phone patch operation and back again. A "null" control is also provided to allow adjustment on any telephone circuit for optimum isolation between transmitter and receiver.

The unit is housed in an attractive maroon cabinet made of heavy guage steel and styled with modern square corners. It is suitable for horizontal mounting on the operating desk or for vertical mounting between existing equipments. An exclusive feature is a removable etched aluminum front plate which also allows the basic chassis to be removed from the cabinet and mounted in an existing enclosure such as a control box, speaker cabinet or master station control. The front plate may then be mounted on the front of the enclosure thus providing an attractive, professional-looking, custom installation.

INSTALLATION AND INITIAL ADJUSTMENT

Installation of the Viking Phone Patch is very simple and straightforward with nearly all commercial transmitters and receivers.

1. Determine where the Phone Patch will be located. Choice of location should be determined primarily by the telephone circuits since it is advisable to keep the leads to the telephone circuits short if possible. Operating convenience, of course, will also determine the location of the Phone Patch. The Phone Patch may be mounted vertically or horizontally. If one prefers to custom mount the Phone Patch in an existing control box, speaker enclosure or other station control proceed as follows:
   1. Remove the knob on the MICRO-PATCH switch.
   2. Remove the 3/8" nut from the switch bushing.
   3. Remove the two self-tapping screws near the NULL control.
   4. The chassis, front plate and cabinet can now be taken apart.
   5. Use the chassis and etched aluminum front plate to determine where the Phone Patch chassis will be mounted and to be sure enough chassis room and panel space is available.
   6. Use the front panel of the Phone Patch as a template and mark the centers of the 3 control knob holes, the switch hole and the two small panel mounting holes on whatever enclosure the chassis will be mounted.
   7. Drill the 3 control knob holes and the switch hole using a 3/8" diameter drill and drill the two small mounting holes to 1/8" diameter.
   8. Place the Phone Patch chassis in position behind the enclosure panel with the controls and switch shaft protruding through the proper holes.
   9. Place the etched aluminum front plate over the controls and secure with the two self-tapping screws and the 3/8" nut.
   10. Replace the switch knob.
2. Once having located the Viking Phone Patch, (refer to figure 2 for typical connections) connect the station microphone to the two-pin female jack on the rear of the Phone Patch. If the present microphone has a single circuit connector it may be advisable to remove the two pin male connector from the cable on the Phone Patch and put it on the microphone cable. The single contact microphone connector may then be put on the cable from the phone patch and will mate with the station transmitter. See Figure 1 for assembly deails if the connectors are to be interchanged.
3. Connect the connector on the end of the cable of the Phone Patch to the station transmitter microphone input jack.
4. Connect two leads to the terminals marked L1 and L2 on the rear terminal strip of the Phone Patch. These should be twisted or shielded leads and long enough to reach the telephone set or the telephone junction box near the telephone.

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5. Check to make certain the switch is in the MICRO position. Connect the other ends of the two leads of step 4 to the line terminals in the telephone junction box or the base of the telephone. These may be readily identified as the two terminals to which the red and green "line" wires are connected. The yellow wire is usually a ground wire.
6. Connect a lead from the "hot" side of the speaker voice coil to the terminal marked SPKR on the rear terminal strip of the Phone Patch. There should be no other leads connected to the hot speaker terminal. The other side of the speaker should be grounded.
7. Connect a ground lead to the ground stud provided on the rear terminal strip of the Phone Patch.
8. The last connection to be made may vary somewhat depending on the individual installation. A lead must be connected to the RCVR terminal on the terminal strip on the rear of the Phone Patch and must eventually connect to the 4 ohm output of the station receiver. In some installations the receiver audio output is tied into the exciter for anti trip circuit purposes and is subject to internal switching in the transmitter. This is the reason for the different installation diagrams, Figure 2a through 2c. Refer to Figure 2 and connect the lead from the RCVR terminal on the rear of the Phone Patch to the appropriate point for your installation. In almost every case the following rule will hold: Any switching or other auxiliary paths of the 4 ohm audio output of the receiver should be done between the receiver 4 ohm audio output terminal and the RCVR terminal on the Phone Patch. The switching must be such that when the units are in the "receive" position the receiver audio output will be present at the RCVR terminal on the phone patch.

This completes the installation of the Viking Phone Patch.

It is advisable to make the following initial adjustments before attempting to use the Phone Patch. Most of these adjustments will change little, if at all, during subsequent use.

1. The Phone Patch should be properly installed and connected as mentioned above.
2. Make certain the Phone Patch switch is in the MICRO position.
3. Tune the station transmitter to a clear channel or into a dummy load.
4. Tune in a steady strong signal on the station receiver and adjust the receiver Audio Gain for a comfortable listening level.
5. If voice operated operation is contemplated adjust the VOX and anti-trip controls on the transmitter for proper voice operation. Set transmitter for manual operation but do not energize.
6. Set the three controls on the Phone Patch so that the green portions of the controls are centered on the number "5".
7. Call a local party on the telephone and explain that their help will be required on some tests.
8. Turn the Phone Patch switch to the PATCH position. This will disable the speaker and transfer the receiver audio into the phone line. It also disconnects the microphone from the transmitter input and connects the phone line audio into the transmitter input. The station operator must use the telephone for listening or talking.
9. While listening to the received signal in the telephone adjust the RCVR GAIN control on the Phone Patch until a suitable audio level is obtained in the telephone.
10. Energize the transmitter and have the person on the other end of the phone line speak in a normal voice. Adjust the XMTR GAIN control to obtain normal
11. Turn the transmitter to the VOX operated position. At this point the signal from the receiver may tend to turn on the transmitter. Slowly rotate the NULL control through its range. An area will be found where the received signal no longer energizes the transmitter. Set the NULL control to the center of this range.
12. Check to see that when the party on the other end of the line speaks, the VOX circuit is properly energized.
13. Set switch to MICRO position.

The initial adjustments are now complete and the Phone Patch is ready for operation.

OPERATION

There are two basic modes of operation to be concerned with when using the Phone Patch. These are normal microphone operation and phone patch operation.

Normal Microphone Operation:

1. Set the Phone Patch to the MICRO position. This automatically connects the microphone into the transmitter audio input, enables the speaker, and disconnects the Phone Patch from the telephone lines.
2. The operating procedure with the Phone Patch in the MICRO position is exactly the same as it would be without the Phone Patch installed.

Phone Patch Operation:

1. Make sure the initial adjustments are made as described above.
2. When making a patch, call the party on the telephone. Explain that they will be "on the air" when they are talking and indicate the rules regarding profanity. When someone is to use the patch for the first time it is also well to explain the procedures which will be involved in either voice operated transmitting or in push-to-talk operation. The party may have to indicate by the word "over", or some other expression, when they are through so that the PTT or manual operated switch may be thrown at the proper times for transmitting and receiving.
3. Once the party has been contacted and the explanations completed, turn the switch on the phone patch to the PATCH position. This will automatically feed the receiver audio into the phone line and transfer the phone line audio to the transmitter input as well as disabling the station microphone and speaker.
4. The station operator will have to listen on his telephone and speak into it in order to hear the conversation. In a VOX installation the operation of the patch is automatic and people will quickly become accustomed to the pause in the conversation so that they may answer or listen at the proper times.
5. In a push-to-talk (PTT) installation the station operator will have to follow the conversation in his telephone and manually operate or disable the transmitter when the party on his telephone wants to speak or listen as the case may be.
6. When the patch is completed be sure the switch is returned to the MICRO position.

There are a few important rules to follow regarding a Phone Patch.

1. Call the party on the telephone and explain that he will be on the air. Caution him on his procedure and speech. Explain any special operating procedures he should observe, THEN switch to the PATCH position.
2. Keep the phone line speech levels as low as possible by means of the RCVR and XMTR GAIN controls. High levels cause cross talk and interfere with other

3. Don't jeopardize your license by accepting commercial calls, or observing other improper operating procedures.
4. Don't let the dial tone, dial clicks or the operators voices go out over the air.
5. Keep the Phone Patch switch in the MICRO position at all times except when actually handling the main portion of the phone patch traffic itself.

TROUBLESHOOTING

The Phone Patch itself should be fairly trouble free, however in some transmitter receiver set-ups with poor installations one might experience trouble.

One trouble which may be encountered is excessive RF feedback. The Viking Phone Patch has been designed to provide a high degree of RF filtering. If RF feedback does occur, check all grounds for good contact. Check to see that the equipments are properly grounded. There should be a small RF by-pass capacitor across the telephone microphone. The local telephone office has capacitors intended for this application and will install them when requested to do so. Good operating practice will usually clear up any RF feedback troubles.

It may be possible, in rare instances, that a balance cannot be obtained with the NULL control, as evidenced by receiver audio energizing the VOX circuits. This would only happen where the telephone lines have very unusual characteristics. If it does happen in your community the 1MF 200 capacitor, C3, will have to be changed. The proper value will have to be found experimentally. To check the null an ac millivoltmeter is very handy, however, it can be done with a set of earphones or the station transmitter. The Phone Patch should be properly installed except that the cable to the transmitter audio should be disconnected and the chassis removed from the cabinet. The MICRO-PATCH switch should be in the MICRO position.

1. Tune in a steady carrier on the station receiver. Turn on the BFO and adjust for approximately a 1000 cycle note. Adjust the receiver audio gain for good listening level.
2. Connect some type of detector, such as an ac millivoltmeter or a set of headphones to the connector on the end of the cable from the phone patch. With the 2 contact connector this should be connected to the No. 1 pin. With the single contact connector it should be connected to the center terminal.
3. Call a friend on the telephone.
4. Turn switch to the PATCH position. The audio tone from the receiver should be evident in the telephone receiver.
5. The voltmeter or earphones connected to the Phone Patch transmitter cable will also indicate this tone. Adjust the NULL control for minimum voltmeter reading or headphone level. If a good minimum cannot be reached substitute different values of capacity for C3 until the lowest minimum reading is obtained. Always readjust the NULL control each time a new value of capacity is tried.
6. When the best null is obtained as evidenced by the lowest voltmeter reading or near absence of signal in the headset, solder that value of capacity in the circuit.

If any other troubles are experienced the best approach is good common sense reasoning and frequent reference to the schematic Figure 3.

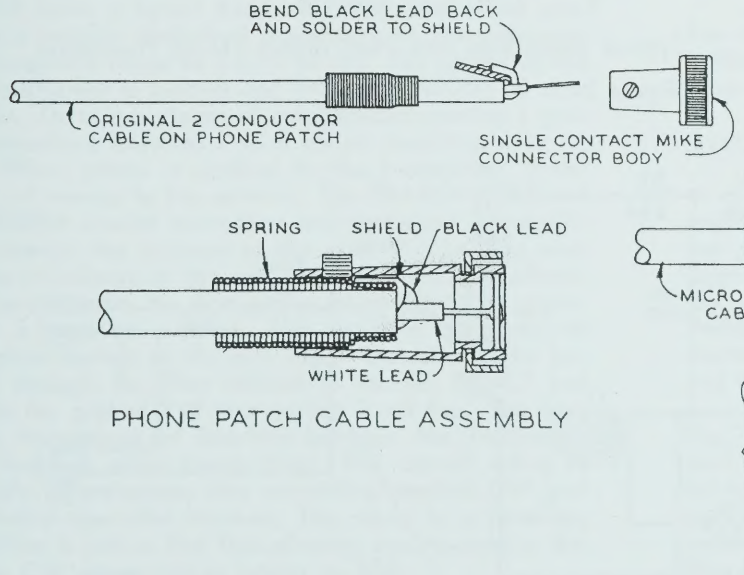
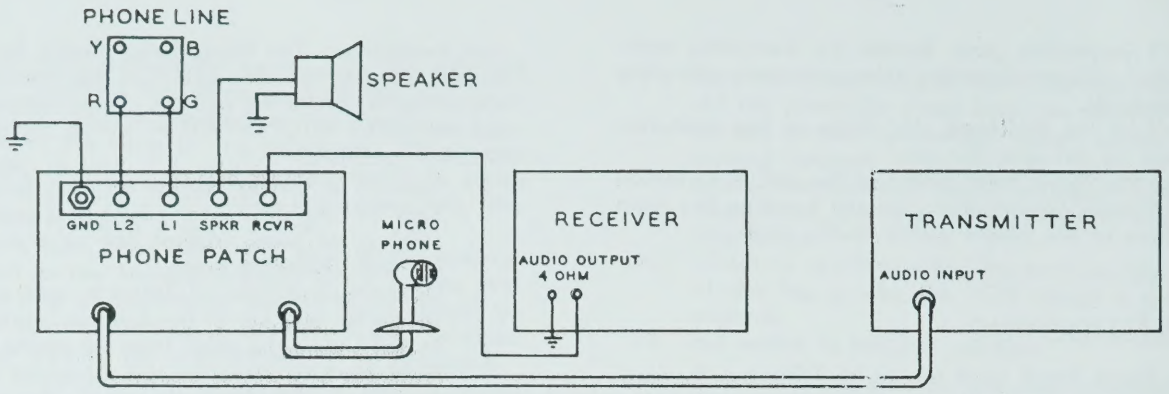
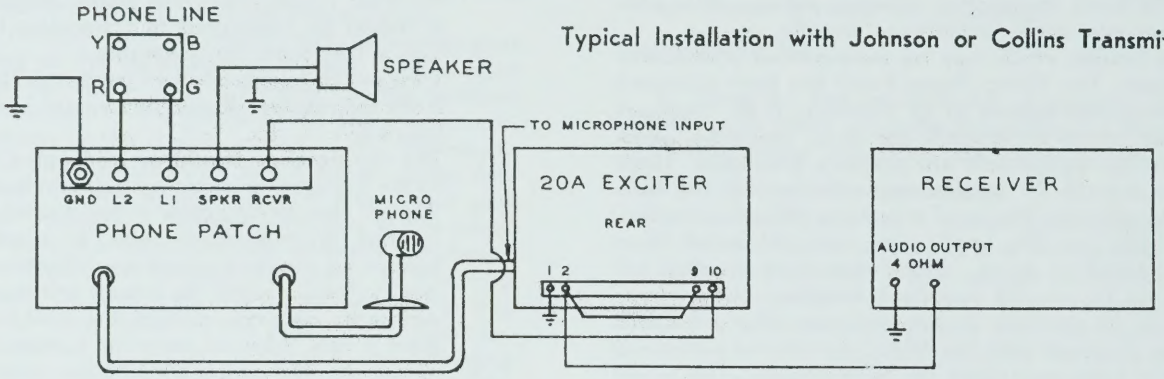


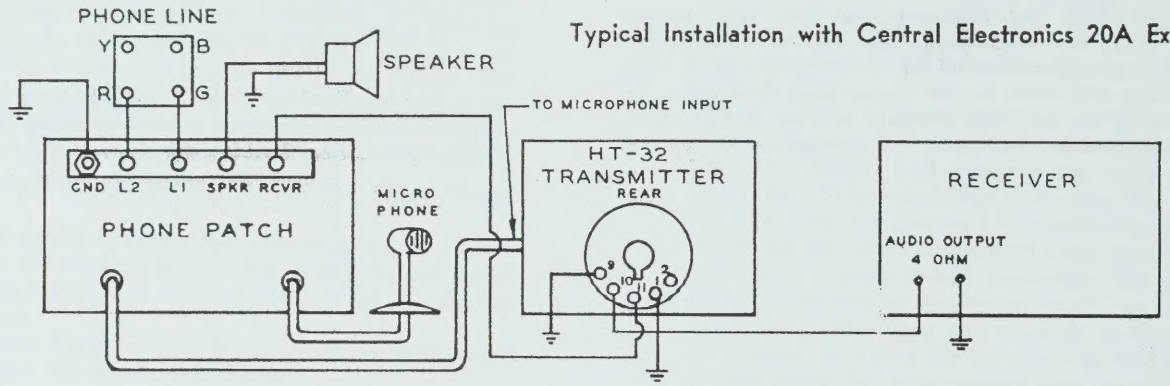
Figure 1



Typical Installation with Johnson or Collins Transmitters

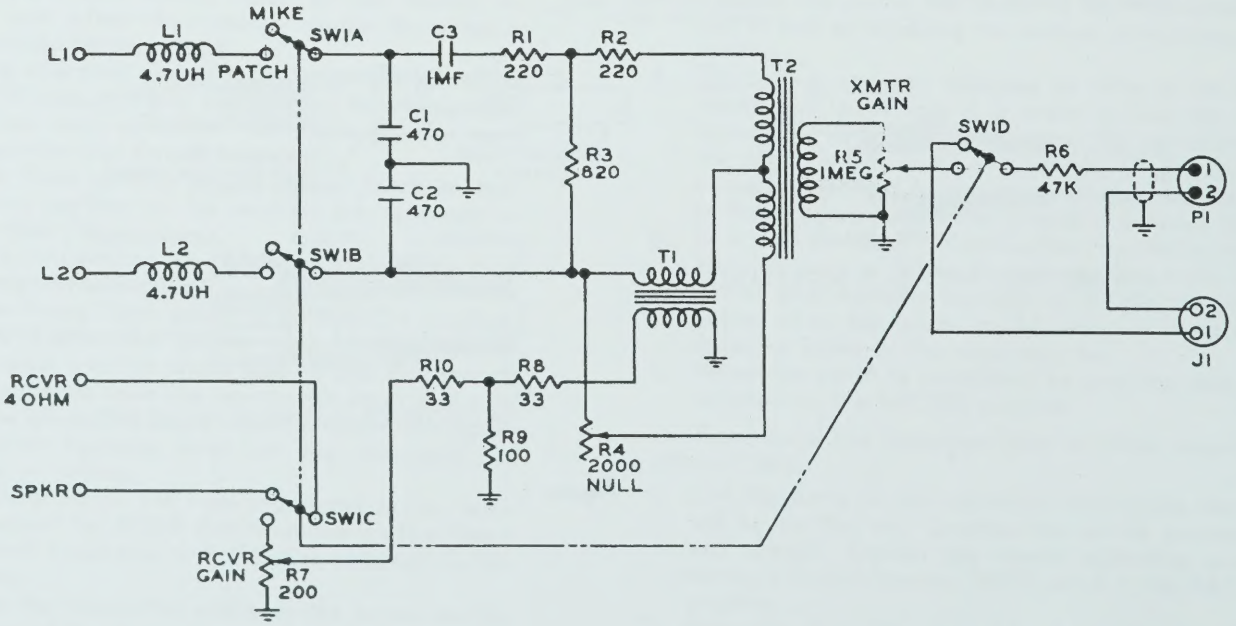


Typical Installation with Central Electronics 20A Exciter



Typical Installation with Hallicrafters HT-32 Transmitter

Figure 2

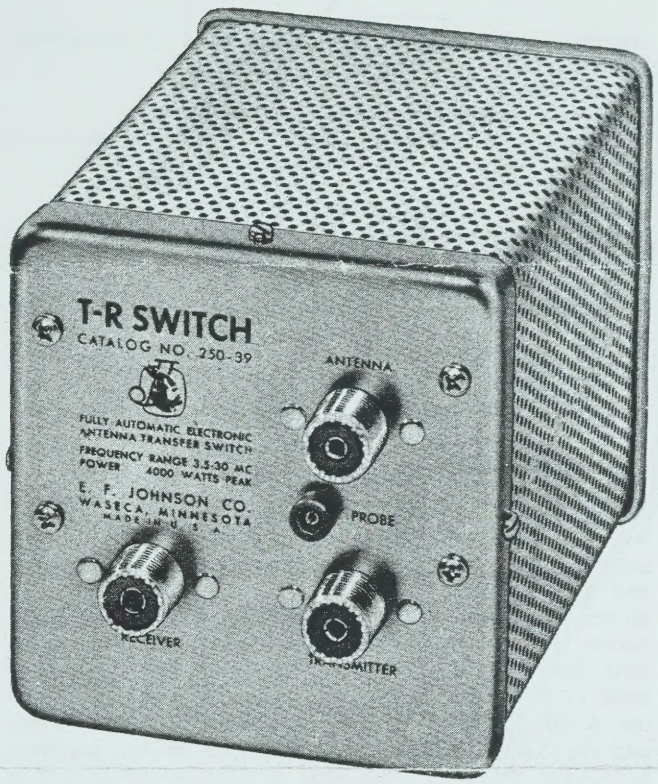


T-R SWITCH

CATALOG NO. 250-39

design file

INSTALLATION AND OPERATING INSTRUCTIONS



GENERAL DESCRIPTION

The Johnson T-R Switch is a device to provide instantaneous and automatic transfer of an antenna from receiver to transmitter, electronically. It will replace the usual antenna relay with its moving parts and attendant problems. It will provide perfect automatic break-in on AM, CW, or SSB. The Johnson T-R Switch is designed to operate over the frequency range of 3.5 to 30 mc with transmitter power inputs up to 4000 watts peak envelope power without any tuning or other manual control functions. The T-R Switch has no power loss on transmitting, does not alter the antenna SWR and actually provides a gain of from 2 to 6 db minimum on receiving, depending on the operating frequency.

The unit is housed in an attractive nickel plated steel cabinet which is shielded and ventilated. The cabinet is 4¼ inches wide by 4½ inches high and 5 9/32 inches deep. It has three type SO-239 coaxial connectors to accommodate the coaxial lines from the antenna, transmitter and receiver. It has no controls and need only be provided with 115 volt 60 cycle power.

THEORY OF OPERATION

The Johnson T-R Switch utilizes a type 6BL7 tube operating as a cascode type amplifier, see schematic diagram, Figure 2. When receiving, the signal from the antenna is coupled to the first grid of V1, which is a grounded cathode type amplifier. The amplifier signal from the plate of V1A is coupled to the cathode of V1B which is connected as a grounded grid stage. The plate of V1B feeds a broad band r-f transformer which provides a suitable plate load impedance to the tube over the frequency range of 3.5 to 30 mc. The output of the r-f transformer is tapped and feeds the RECEIVER connector. These two stages of amplification provide a gain of somewhere between 2 to 6 db on receiving.

When power is applied to the transmitter, it delivers r-f energy to the antenna. The TRANSMITTER and ANTENNA coaxial connectors are connected in parallel. This energy also appears at the grid of V1A. As soon as the r-f voltage on the antenna overcomes the cathode bias on the tube, the grid begins to conduct thus generating a negative voltage. This negative bias cuts off the plate current of the first tube. The bias is also applied through the filter network of R2, R3, R4, C7 and C8 to the grid of V1B thus cutting it off too. This provides two stages of isolation between the transmitter and receiver while transmitting. This cut-off action is virtually instantaneous thus permitting perfect CW and SSB voice operation break-in. The return to a receiving condition is just as fast thus allowing one to copy in between CW characters or breaks on SSB.

The 6BL7 is a rugged dependable tube capable of handling large power inputs due to its large grid voltage ratings. In the Johnson T-R Switch, the cathode bias on the first section of the 6BL7 is such that strong local signals, amateur or otherwise, will not cause spurious signals to be generated and introduced to the station receiver, thus making copy of weak signals difficult — a common fault in other types of T-R Switches.

A 6X4 tube is used in a well filtered full wave rectifier circuit to provide power for the 6BL7. The a-c line is filtered with "L" section filters to provide good TVI suppression.

INSTALLATION

Installation of the Johnson T-R Switch is simple-requiring only three coaxial cable connections and 115 volt power. It is recommended that the T-R Switch be located as near the transmitter as possible so as to keep the length of the cable between the transmitter and T-R Switch to a minimum. It is also recommended that the station low pass filter be placed between the antenna and the T-R Switch. Refer to Figure 1.

Connect the cable from the transmitter output to the TRANSMITTER connector on the T-R Switch. Connect the cable from the receiver antenna input connnector to the RECEIVER connector on the T-R Switch. Connect the coaxial cable from the low pass filter or the antenna to the ANTENNA connector on the T-R Switch. Plug the 115 vac plug into a power receptacle.

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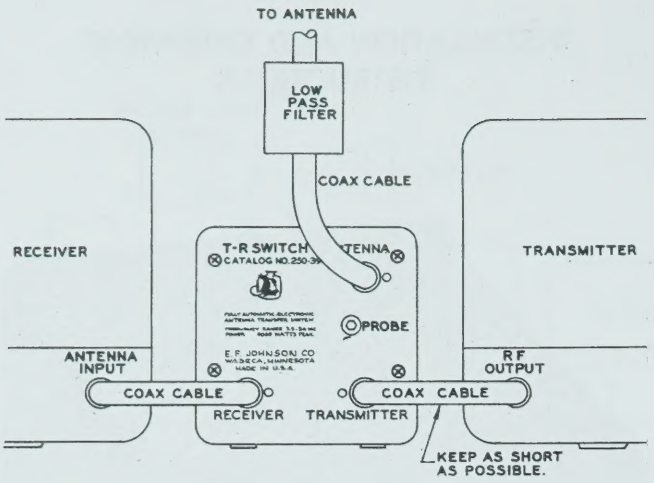

FIGURE 1.

OPERATION

The operation of the Johnson T-R Switch is automatic. There is no ac power switch on the unit, so it is recommended that the unit be powered from an outlet that can be switched along with general station power. If an adverse length of coaxial cable is used between the transmitter and the T-R Switch it is possible that the impedance of the transmitter output might be reflected and transformed so that it appears as a shunt across the antenna. This may degrade the signal level at the receiver. To check this, disconnect the transmitter cable from the TRANSMITTER CONNECTOR. If the signal level at the receiver improves, it may be necessary to use a different length of line between the transmitter and the T-R Switch. A good discussion of this problem is found in the May 1956 issue of QST magazine and is recommended reading. It might be mentioned at this point, that any noise present at the transmitter output in the receiving condition will be amplified by the T-R Switch. It is essential that the transmitter be blocked off sufficiently in the receive condition so that diode noise from the power tubes is not present. Most commercial transmitters such as the Johnson Ranger, Valiant, Pacemaker, 500 etc., have sufficient blocking bias supplied to suppress this noise. If noise is experienced in the receive condition, it may be necessary to take steps to eliminate this noise from the station transmitter.

A nylon tip jack is available on the front panel of the T-R Switch and is coupled directly to the antenna through a 3 uuf capacitor. This may be used for providing r-f power for monitors or scopes to check on the transmitted signal. It may be necessary to increase or decrease the size of the coupling capacitor depending on how this probe is used.

There is no provision in the T-R Switch for muting the station receiver. This is not a problem in CW since it provides a means of monitoring one's sending, however, in SSB and AM it may cause audio feedback into the microphone and as such one will have to provide a means of muting or placing the station receiver in standby when the transmitter is energized. Most commercial SSB and some AM transmitters have this function provided for in their voice operate or push-to-talk relays. Other AM transmitters may require some external means for muting the receiver such as a set of contacts on a push-to-talk relay.

The T-R Switch runs quite warm to the touch. This is normal and should cause no concern.

TROUBLE SHOOTING

The components of the T-R Switch are operating well within their ratings and should require little maintenance. In the case of difficulty, a list of resistance and voltage readings is provided in Table I. It is difficult to predict the dc voltage at the grids of V1 under the transmitting condition since they will vary with the transmitter power level and antenna impedances. It will be approximately equal to $\sqrt{2PR}$ where P is approximate output in watts and R is the antenna resistance in ohms. This negative voltage will appear at pin 1 of V1 when transmitting. The voltage at pin 4 in this condition will be equal to about 95% of the value at pin 1. The 6BL7 cathode voltages in the transmit condition would be nearly zero and the plate voltages will be about 190 vdc.

TABLE I

RESISTANCE AND VOLTAGE MEASUREMENTS

Readings may vary ±10%

PIN	1	2	3	4	5	6	7	8
6BL7 Voltage	0	170	3.6	0	170	7.3	0	6.2 vac
Resistance	1.05	100K	100	2 meg	100K	560	0	.3
6x4 Voltage	190AC	0	6.2 vac	0	0	190AC	197	
Resistance			.3	0			100K	

Measured with 20,000 ohms/volt multimeter
Resistance Readings in ohms, taken with Power Off

Voltage Readings taken with 115 vac input, No RF power at ANTENNA or TRANSMITTER Connectors.

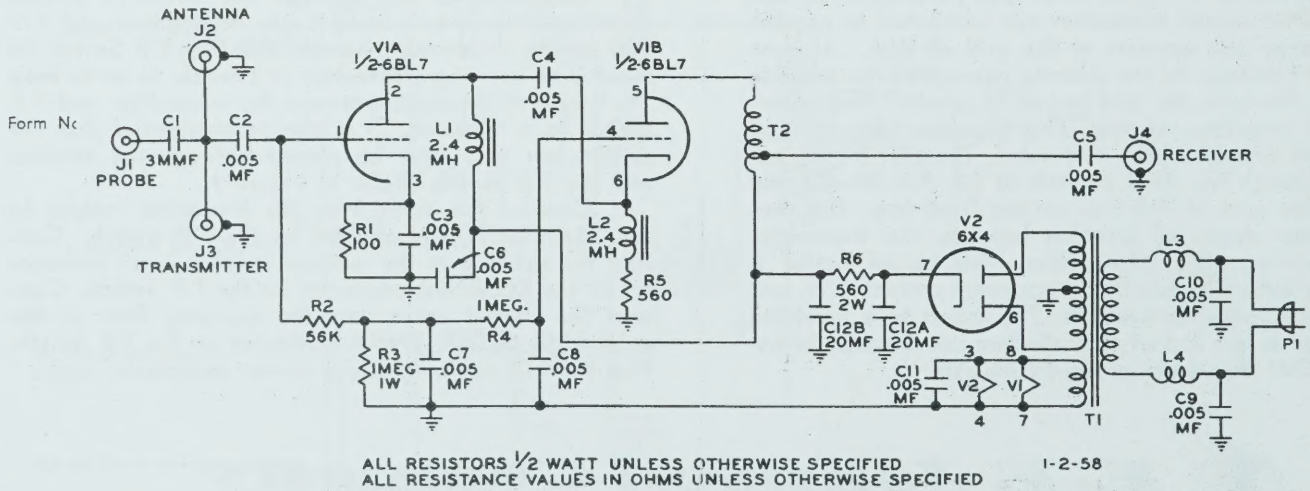

FIGURE 2.

T-R SWITCH

CATALOG NO. 250-39

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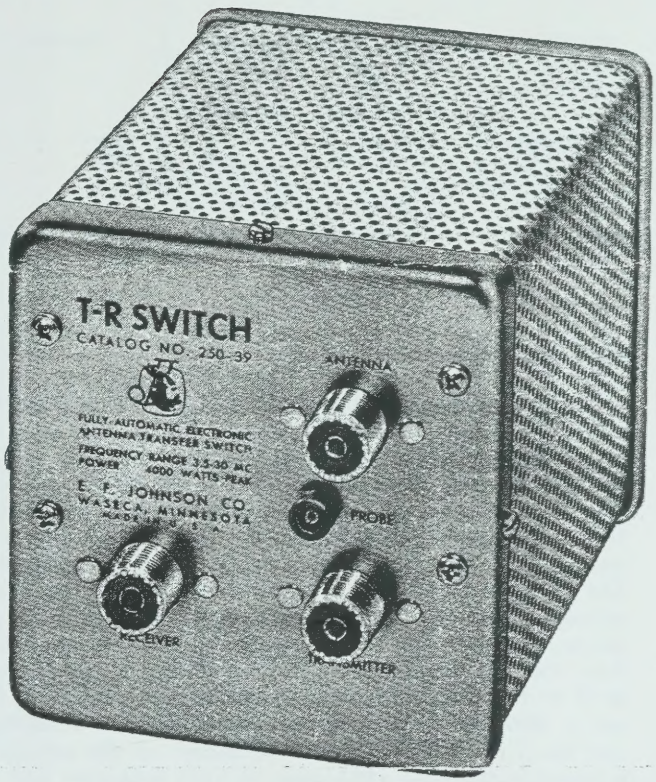
INSTALLATION AND OPERATING INSTRUCTIONS



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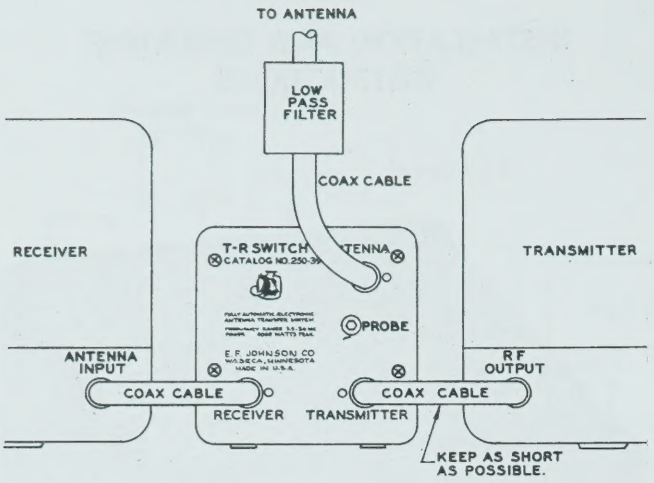

FIGURE 1.

OPERATION

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TABLE 1

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Readings may vary ±10%

PIN	1	2	3	4	5	6	7	8
6BL7 Voltage	0	170	3.6	0	170	7.3	0	6.2 vac
Resistance	1.05	100K	100	2 meg	100K	560	0	.3
6x4 Voltage	190AC	0	6.2 vac	0	0	190AC	197	
Resistance			.3	0			100K	

Measured with 20,000 ohms/volt multimeter
Resistance Readings in ohms, taken with Power Off

Voltage Readings taken with 115 vac input, No RF power at ANTENNA or TRANSMITTER Connectors.

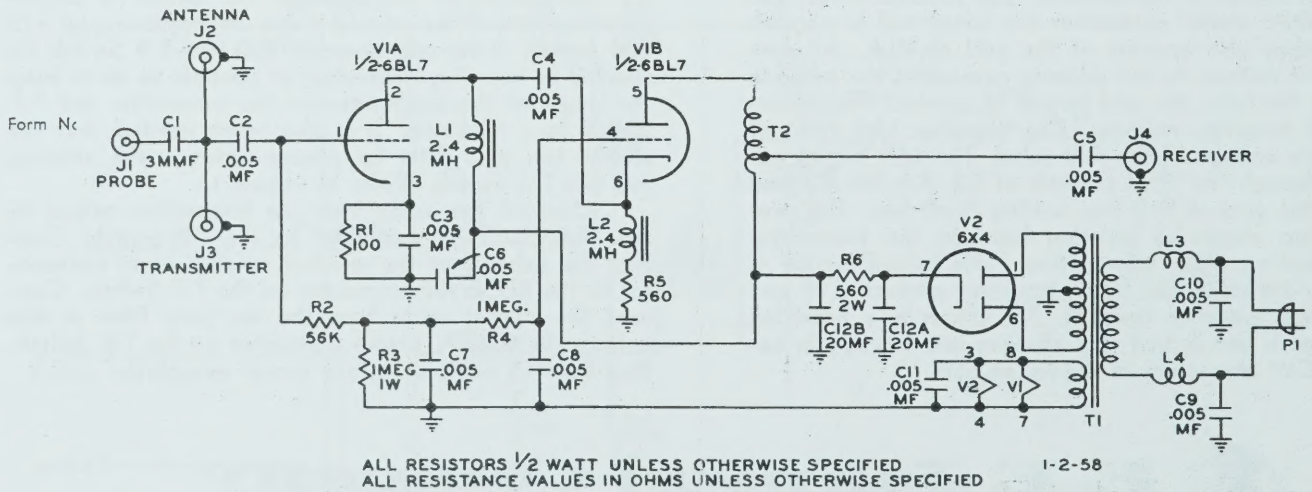


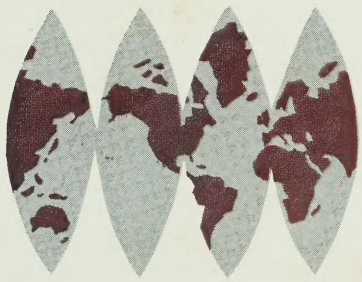
FIGURE 2.

amateur catalog 965-A

Viking

Amateur Transmitters and Accessories

first choice of amateurs the world over



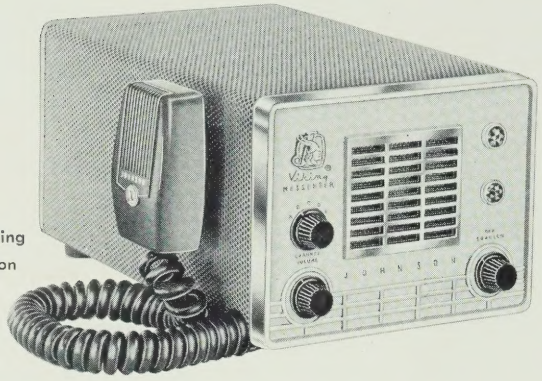
E. F. JOHNSON COMPANY
WASECA, MINNESOTA, U.S.A.

10 Watts AM input

Instant selection

of 5 frequencies

Viking 10 Meter "Messenger"



For information concerning Civil Defense Certification — See back cover.

The Viking "10-Meter Messenger" is a superbly-engineered transceiver in one compact package, ideally suited for use in a fixed location or for under-dash mounting in a mobile vehicle or boat. The "10-Meter Messenger" provides instant selection of five pre-tuned frequencies in the range of 29.4 to 29.7 megacycles, within a 300 kc segment of the 10-meter band.

Designed with 10 tubes (including rectifier), the "10-Meter Messenger" is completely crystal controlled. The superheterodyne receiver is extremely sensitive, enabling you to hear signals clearly which would be lost in less sensitive equipment. Greater selectivity reduces interference from adjacent channels . . . keeps your received signal clear and crisp for greater intelligibility . . . permits greater communication distance. Built-in automatic noise limiter (ANL) suppresses ignition and other electrical noises from neon signs, power lines, etc. . . . automatic volume control effectively prevents distortion at close ranges. The automatic "Squelch" control lets you set the receiver sensitivity as desired, to eliminate annoying background noises.

The transmitter is designed with a 7054 crystal oscillator coupled to a high gain 7061 final amplifier . . . puts out a clean, crisp, well-modulated signal! Rugged push-to-talk ceramic microphone will not be affected by either moisture or heat . . . sturdy die-cast front panel and heavy-gauge steel cabinet help protect the unit from accidental damage from shock or vibration. Other features include a wide range pi-L network output circuit; automatic "Transmit" indicator; self-contained power supply.

The "10-Meter Messenger" is exceptionally easy to install anywhere — under the dashboard of an automobile (with little or no sacrifice of leg room), in a boat, or practically anywhere you choose. Dual voltage units will operate on either 6V DC or 115V AC; or 12V DC and 115V AC with just the switch of a power cord (furnished with the unit). The "10-Meter Messenger" comes completely equipped with power cords, tubes, microphone and crystals for 29,640 kc, the national calling and emergency frequency. Up to 4 additional crystal pairs may be installed for other frequencies for routine operation.

SPECIFICATIONS

FREQUENCY RANGE:
Pre-tuned for 29.4 to 29.7 mcs.

POWER INPUT:
10 Watts Amplitude Modulated Phone

POWER REQUIREMENTS:
(2 models Available)
6V D.C. and 115V A.C.
12V D.C. and 115V A.C.
80 watts maximum.

FUSE PROTECTION
Fused power cord

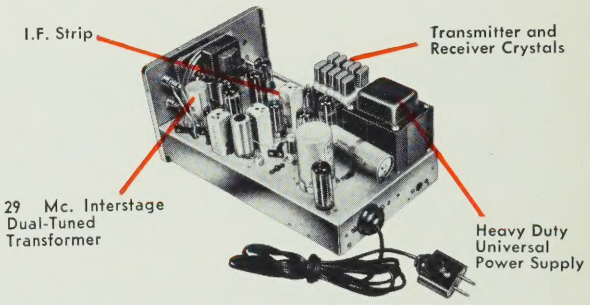
TUBE COMPLEMENT

6BJ6—R.F. Amplifier
12B56—Mixer — Crystal Oscillator
6BJ6—I.F. Amplifier
6AL5—Detector, AVC, ANL
12AU7—First Audio and Speech Amplifier
6AW8—Second Audio Amplifier, Squelch
12AB5—Modulator
7054—Crystal Oscillator
7061—Power Amplifier
12BW4—Rectifier

The Viking "10-Meter Messenger" is available wired and tested only in a compact grey wrinkle-finish cabinet with a handsome chrome-plated front panel. Dimensions: 5⅝" high x 7" wide x 11⅜" deep. Net weight: 12¼ lbs. Shipping weight: 17 lbs.

Cat. No. 242-202 115V and 6V . . . "10-Meter Messenger" complete with tubes, microphone, and one pair of crystals . . . . . **$139.75** Amateur Net

Cat. No. 242-203 115V and 12V . . . "10-Meter Messenger" complete with tubes, microphone, and one pair of crystals . . . . . **$139.75** Amateur Net



10 Meter "Messenger" Accessories

Cat. No. 251-828 Universal dash mounting kit. For mounting the 10 Meter "Messenger" under the dashboard of car, truck, or boat . . . . . **$2.50 Amateur Net**

Cat. No. 251-830 Sturdy etched aluminum carrying handle. Easily mounted. Convenient swing-away feature when not in use . . . . . **$1.50 Amateur Net**

Viking "Challenger"

120 watts CW input, 80 through 10

...85 watts on 6 meters

70 watts phone, 80 through 6 meters!

The new Viking "Challenger" is ideal for the novice or experienced amateur for fixed station, emergency, portable, or field day use! A full size transmitter with three RF stages, the "Challenger" is designed for fast, easy tuning, excellent stability, and plenty of reserve drive! Instant bandswitching 80 through 6 meters — 70 watts phone input — 120 watts CW input 80 through 10 meters and 85 watts CW input on 6 meters! Straight through final amplifier operation even on 6 meters provides excellent efficiency and modulation characteristics.

FREQUENCY CONTROL — The "Challenger" may be controlled by plug-in crystals or any VFO delivering 5 miliwatts (8 to 10 volts across 22,000 ohms) or more output on 160 or 80 and 40 meters.

OUTPUT CIRCUIT — The wide range, Hi-"Q" output circuit is designed to handle 40 to 600 ohm resistive antenna loads and will also tune out large amounts of reactance. Plate circuit capacitor switching provides the best combination of variable and padding capacity for easy tuning and proper loading. Final amplifier has two husky 6DQ6A bridge neutralized tetrodes driven by a single 6DQ6A buffer.

"SHAPED" KEYING CIRCUIT — Designed particularly to satisfy the critical CW operator, the "Challenger's" special "LC" keying circuit provides true "shaped" CW waveform and suppresses clicks and chirps.

AUDIO SYSTEM — A built-in high gain 12AX7 dual triode speech amplifier permits the use of any crystal or high impedance dynamic microphone. A rugged 6AQ5 clamp tube modulator provides modulation levels up to 100% with clear, distinct audio response. On CW the 6AQ5 serves as a clamper, protecting the final amplifier tubes.

TVI SUPPRESSION — The cabinet of the "Challenger" is effectively shielded for TVI suppression. Power line and meter are equipped with "L" section filters. Interior harness leads and filaments are by-passed. Careful by-passing of the final amplifier and special circuit techniques minimize harmonics in the output circuit.

POWER SUPPLY — The built-in power supply delivers 550 volts DC at 275 ma., 6.3 volts AC at 5 amps, and 5 volts AC at 3 amps. Fused power line plug protects transmitter against abnormal overloads.

SPECIFICATIONS

FREQUENCY RANGE:
80, 40, 20, 15, 10, and 6 meters

POWER REQUIREMENTS:
105-125 volts AC, 50-60 cycle single phase. 270 watts maximum.

POWER INPUT:
70 Watts Amplitude Modulated Phone — 80 through 6 meters.
120 Watts Continuous Wave — 80 through 10 meters.
85 Watts Continuous Wave on 6 meters.

TUBE COMPLEMENT

6AU6 — Oscillator
6DQ6A — Buffer-Multiplier
6DQ6A — Final Amplifier (2)
12AX7 — Cascade Speech Amplifier
6AQ5 — Clamper and Screen Modulator
5U4GB — Rectifier

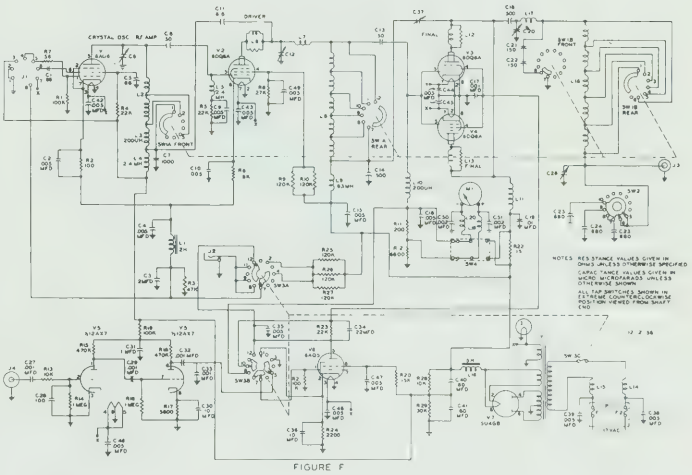


FIGURE F

The Viking "Challenger" is available completely wired and tested or as an easy-to-assemble kit. The aluminum cabinet is finished in attractive maroon and grey with green nomenclature. Assembly instructions for the kit include photographs, diagrams, and step-by-step wiring directions. Wiring harness, all necessary hardware furnished — no drilling or metal work necessary. Dimensions: 13¼" wide x 9⅛" high x 10⅛" deep. Net Weight: 24 lbs. Shipping Weight: 28 lbs.

Cat. No. 240-182-1 Viking "Challenger" Kit with tubes . . . . . .

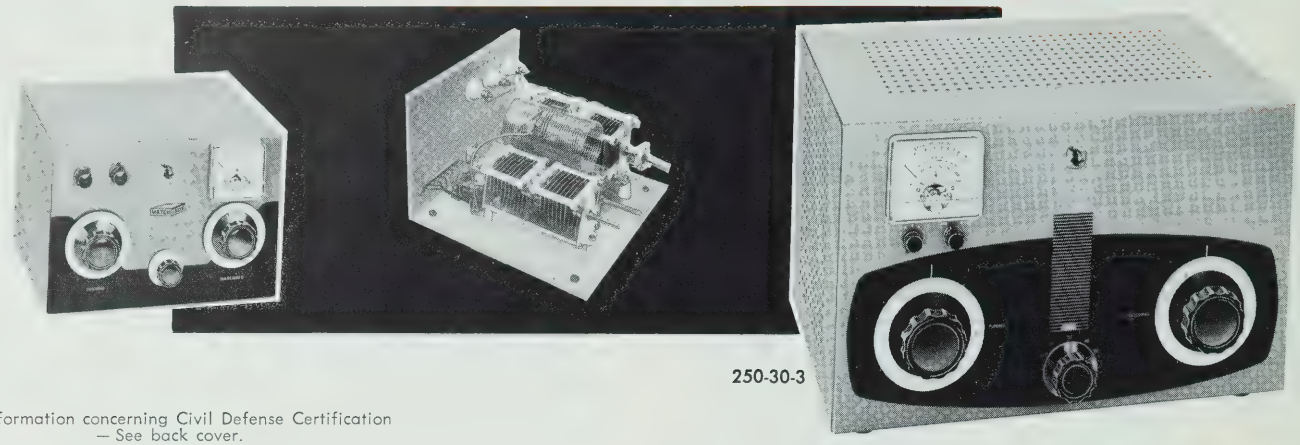
AMATEUR NET **$124.75**

Cat. No. 240-182-2 Viking "Challenger" wired and tested, with tubes . . . . . **$169.75** Amateur Net

Bandswitching

No plug-in coils

Viking "Matchboxes"



250-30-3

For information concerning Civil Defense Certification — See back cover.

The new Viking "Matchboxes" are completely integrated antenna matching and switching systems for CW and Amplitude Modulated transmitters up to 275 watts or one kilowatt with provision for continuous monitoring of either incident or reflected transmission line power. In SSB mode, the 275 watt unit will handle 750 watts and the kilowatt unit is rated up to 3 kilowatts P.E.P. input. A unique, balanced high "Q" tuned circuit and careful shielding provide more than 20 db of additional harmonic suppression.

Bandswitching on 80, 40, 20, 15 and 10 meters and completely front panel controlled, these versatile new "Matchboxes" are furnished with Directional Coupler and built-in Directional Coupler Indicator. Units will quickly match the transmitter to balanced or unbalanced lines over a wide range of antenna impedances. In addition, the "Matchboxes" are capable of tuning out large amounts of capacitive or inductive reactance. Revolutionary circuit design does away with the annoying use of "plug-in" coils and completely eliminates "load-tapping" necessary in other couplers.

RECEIVER INPUT IMPEDANCE MATCHING — The "Matchboxes" are also designed to provide separate matching of the antenna system to the receiver. A self-contained, heavy-duty change-over relay switches the antenna from receiver to transmitter, grounding the receiver antenna terminals in the "transmit" position, thus preventing damage to front-end components. In addition to antenna change-over, relay also mutes the receiver during transmission. An adjustable link, which requires only initial adjustment, provides an effective impedance match to the receiver, substantially improving receiver performance.

BUILT-IN DIRECTIONAL COUPLER INDICATOR — These new "Matchboxes" with Directional Coupler and self-contained Directional Coupler Indicator provide a continuous reading of Standing Wave Ratio and relative power in the transmission line. Coupler may be permanently installed in the 52-ohm coaxial line or used for other measurement purposes. Indicator consists of a 0-100 microammeter calibrated directly in SWR and relative power. Monitoring of either incident or reflected power may be quickly selected with a switch on the front of the cabinet. A second control on the front panel permits easy adjustment and calibration of the meter.

TUNING AND MATCHING — Antenna tuning and matching is accomplished with just two front panel controls. When changing bands, simply switch to the correct band position, and for proper RF energy transfer adjust the controls for minimum SWR as indicated by the meter. Tuning is sufficiently broad so that a single setting of the controls will cover a large segment of an amateur band.

All "Matchbox" connections are conveniently located at the rear of the unit. Cabinets are attractively finished in maroon and grey, and are effectively shielded to reduce harmonic radiation. The Directional Coupler Indicator and operational controls are located on the front panel, providing convenience and ready visibility. Plastic mounting feet protect the operating table. Units are supplied assembled, wired and pre-tested only — complete operating instructions included.

IMPORTANT NOTE: A suitable RF measuring device such as a SWR Bridge is essential for proper tuning and adjustment of any antenna coupler. The Johnson 250-37 Directional Coupler and the 250-38 Indicator, for power up to one kilowatt, are available as separate catalog items. They provide precision operation and reliability at a moderate price. (See Page 17 for details.)

275 WATT "MATCHBOX"

Designed to match a 52 ohm coaxial link line to reactive and non-reactive loads ranging from 25 to 1500 ohms for balanced lines, and 25 to 3000 ohms for unbalanced lines, this "Matchbox" will match virtually any transmission line terminal impedance, within the above values, throughout the 3.5 to 30 mc amateur band. The link line operates without standing waves, providing a convenient point for the installation of a Johnson 250-20 Low Pass RF Filter for improved harmonic suppression. Feed-through insulators are provided for connecting balanced or unbalanced feedlines. Dimensions: 9⅞" wide x 10½" deep x 7" high. Net Weight: 7¼ lb. Shipping Weight: 11 lbs. For transmitters with a maximum power input of 275 watts.

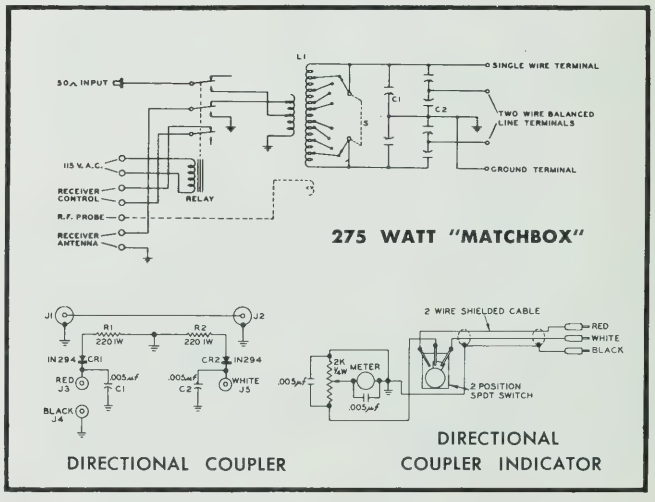
Cat. No. 250-23-3 With Directional Coupler and Indicator ..... **$94.95 Amateur Net**

Cat. No. 250-23-1 Less Directional Coupler and Indicator ..... **$64.95 Amateur Net**

KILOWATT "MATCHBOX"

The Kilowatt "Matchbox" is designed to handle unbalanced line impedances from 50 to 2000 ohms, balanced line impedances from 50 to 1500 ohms. The antenna change-over system includes a time delay circuit for the relay, providing "fast make — slow break" action to prevent arcing or sticking of relay contacts. This feature also protects the transmitter and the receiver components from possible damage due to high voltage transients during antenna change-over switching. Feed-through insulators are provided for connecting balanced or unbalanced lines. A standard SO-239 connector is provided for 52 ohm coaxial lines. Dimensions: 17¼" wide x 12⅛" deep x 10⅞" high. Net Weight: 19 lbs. Shipping Weight: 27 lbs. For transmitters with a maximum power input of 1000 watts.

Cat. No. 250-30-3 With Directional Coupler and Indicator ..... **$154.50 Amateur Net**

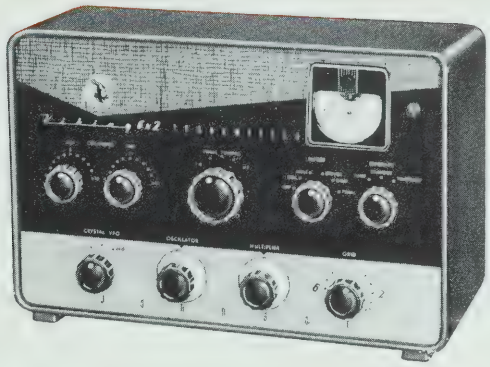


150 watts CW

100 watts phone

Bandswitching 6 and 2 meters

Viking "6N2"



For information concerning Civil Defense Certification — See back cover.

This compact VHF transmitter offers instant bandswitching coverage of both 6 and 2 meters. The Viking "6N2" is completely shielded and effectively TVI suppressed, and may be used with the Viking "Ranger" and "Ranger II," Viking "Valiant" and "Valiant II" or similar power supply-modulator combinations capable of at least 6.3 VAC at 3.5 amp., 300 VDC at 70 ma., 300 to 750 VDC at 200 ma. and 30 watts or more of audio. Power input of the Viking "6N2" is rated at 150 watts CW and 100 watts AM phone.

FREQUENCY CONTROL — The Viking "6N2" may be operated by external VFO or built-in crystal control. 8 to 9 mc crystals are used in a pentode oscillator, which doubles in the plate circuit. This avoids tricky overtone circuits, eliminates critical adjustment and prevents frequency output which is not harmonically related to the fundamental of the crystal. VFO operation may be obtained simply by plugging in an external VFO with an 8-9 mc output and turning the VFO/Crystal switch to the VFO position. Provision for zeroing the VFO is also provided.

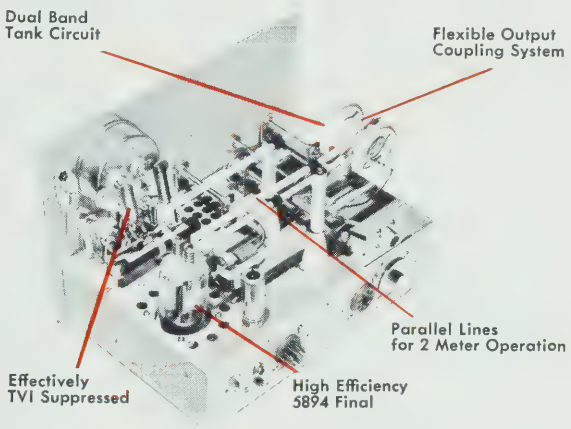
OUTPUT CIRCUIT — The final amplifier uses a type 5894 dual tetrode in a push-pull circuit. It is capable of 150 watts input on CW or FM and 100 watts input on AM phone. The final tank is a dual band device and requires no switching when changing bands. High efficiency is obtained by the use of silver plated balanced tank circuits with parallel lines for maximum efficiency on 2 meters. The output link, which is adjustable, is also a two band device. Series capacitive reactance compensation is incorporated for maximum coupling flexibility.

"SHAPED" KEYING CIRCUIT — Designed particularly to satisfy the critical CW operator, the "6N2" is equipped with a special "LC" keying circuit which provides true "shaped" CW waveform and suppresses clicks and chirps.

TVI SUPPRESSION — The cabinet of the "6N2" is effectively shielded for TVI suppression. Power line and meter are equipped with "L" section filters. Interior harness leads and filaments are by-passed. Careful by-passing of the final amplifier and special circuit techniques minimize harmonics in the output circuit.

TUBE COMPLEMENT

6U8 — (pentode section) — crystal — oscillator — doubler
6U8 — (triode section) — tripler
6360 — tripler-driver
5894 — final amplifier
6AQ5 — clamper



The Viking "6N2" is available only as a completely wired and tested unit. Cabinet is finished in attractive maroon and grey with green nomenclature. Dimensions: 13⅛" wide x 8⅜" high x 8½" deep. Net Weight: 10 lbs. Shipping Weight: 14 pounds.

Cat. No. 240-201-2 Viking "6N2" wired and tested with tubes, less crystals, key and microphone . . . . . .

AMATEUR NET **$194.50**

75 watts CW input

65 watts phone

Completely self-contained

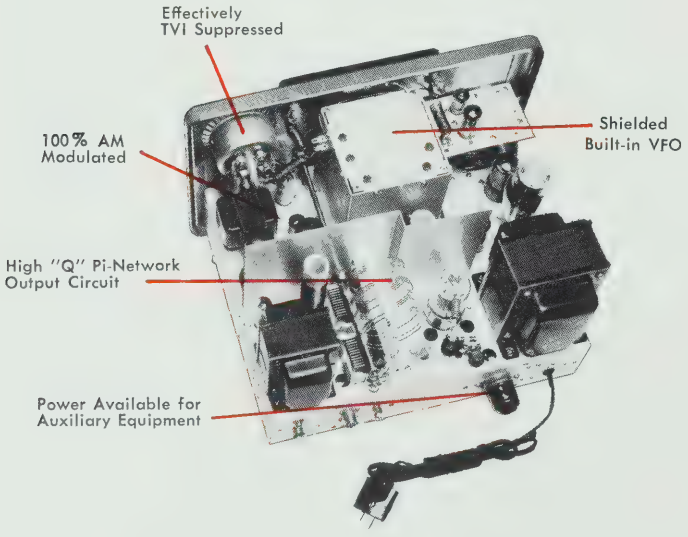
Viking "Ranger II"

Effectively TVI suppressed, and completely self-contained, the Viking "Ranger II" transmitter/exciter is available as a complete, easily assembled kit or as a wired and tested unit. A phone and CW transmitter for 6 through 160 meters, the "Ranger II" may also be used as a flexible exciter without modification.

As a transmitter, the "Ranger II" is a rugged and compact 75 watt CW input or 65 watt phone unit. The "Ranger II" has a pi-network coupling system that will match antenna loads from 50 to 500 ohms and will tune out large amounts of reactance. Single-knob bandswitching on seven amateur bands: 160, 80, 40, 20, 15, 10 and 6 meters — built-in VFO or crystal control. Timed sequence (grid block) keying provides ideal "make" or "break" on your keyed signal, yet the "break-in" advantages of a keyed VFO are retained.

As an exciter, the "Ranger II" will drive any of the popular kilowatt level tubes and will provide a high quality speech driver system for high powered modulators. Control functions for the high powered stage may be handled right at the exciter — no modification required to shift from transmitter to exciter operation. A nine pin receptacle on the rear of the transmitter brings out TVI filtered control and audio leads for exciter operation. This receptacle also permits the "Ranger II" to be used as a filament and plate power source, and also as a modulator for auxiliary equipment such as the Viking "6N2" VHF transmitter.

FREQUENCY CONTROL — The "Ranger II" is equipped with an extremely stable, temperature compensated built-in VFO. Separate, calibrated, bandspread dial scales for each of the seven bands and a 6 to 1 planetary drive mechanism result in exceptional tuning accuracy and velvet smooth control.



Plexiglas dial is edgelighted — Plexiglas pointer is positioned to insure a minimum of parallax. Precise 10 kc calibration increments on each band provide uniform and accurate dial interpolation.

TUNING — The "Ranger II's" basic tuning controls are located on the VFO dial escutcheon. QSY within the phone or CW portion of a band is usually possible by merely changing the VFO frequency setting. For larger frequency excursions, simply touch up the grid (Buffer) tuning, adjust loading, and dip the final.

OUTPUT CIRCUIT — An efficient pi-network tank circuit is used in the final amplifier. Designed to handle 50 to 500 ohm resistive antenna loads it will also tune out large amounts of reactance. Plate circuit capacitor switching provides the best combination of variable and padding capacity for easy tuning and proper loading. Final amplifier tube is a 6146.

TIMED SEQUENCE KEYING — This highly flexible keying system applies wave shaping to the keyed amplifier stages for perfect "make" and "break" on your keyed signal. Signal clicks and chirps are eliminated, yet the "break-in" advantages of a keyed VFO are retained. The system operates so fast that a breaking station may be heard between transmitted dots! Electronically operated, this timed sequence keying system uses no relays and only one dual triode plus a rectifier tube for the grid block bias.

AUDIO SYSTEM — An all-triode speech amplifier permits the use of any crystal or high impedance dynamic microphone. Push-pull 7027A modulators provide 100% modulation, response is limited to 250-3000 cycles for maximum communication effectiveness.

TVI SUPPRESSION — Completely TVI suppressed, the "Ranger II" cabinet is electrically sealed with flexible monel braid on the inside of the front panel and large cabinet overlap. A cup type shield seals the meter, and spring contact washers on the front panel shafts prevent possible radiation from shaft clearance openings. Power line and relay jack have double L type filters; all auxiliary socket, meter, dial lamp, key, and meter lamp leads equipped with L filter networks. To minimize chassis harmonics, interior harness leads and filaments are by-passed. Careful by-passing of the final and special circuit techniques minimize harmonics in the output circuit.

POWER SUPPLIES — Self-contained high and low voltage power supplies use choke input filtering — high voltage supply delivers 500 to 525 V DC to the final and modulators — low voltage supply delivers 300 V DC for the exciter and speech stages. A separate relay jack provides 115 V AC for antenna change-over and control relays, and is energized by the "operate" switch on the front panel.

SPECIFICATIONS

FREQUENCY RANGE:

160, 80, 40, 20, 15, 10 and 6 meters

POWER REQUIREMENTS:

105-120 V AC, 50-60 cycles, single phase, 260 watts maximum.

POWER INPUT:

75 Watts Continuous Wave
65 Watts Amplitude Modulated Phone

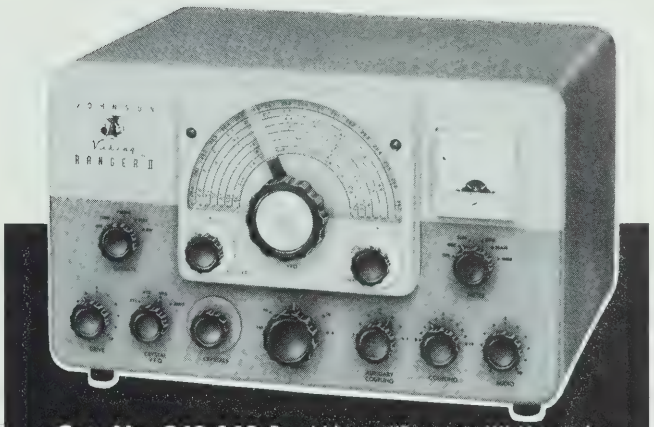
FUSE PROTECTION:

Transmitter fuses are located in the 115 V. power plug.

TUBE COMPLEMENT

6AU6—Variable Frequency Oscillator
6CL6—Crystal Oscillator/VFO Isolator
6CL6—Buffer/Doubler
5763—6 Meter Doubler
12AU7—Keyer Tube
12AX7—Dual Triode Speech Amplifier
12AU7—Dual Triode Audio Driver
OA2—Voltage Regulator
6146—Final Amplifier
6AQ5—Clamper
7027A—Push-Pull Modulators (2)
6AL5—Bias Rectifier
6AX5GT—Low Voltage Rectifier
5R4GY—High Voltage Rectifier

The Viking "Ranger II" is available completely wired and tested or as a complete, ready to assemble kit. The 18 gauge steel cabinet is finished in attractive two-tone grey, with maroon knobs and nomenclature. Assembly instructions for the kit include photographs, diagrams and step-by-step wiring directions — wiring harness, all necessary hardware, and connectors furnished — no drilling or metal work necessary. Dimensions: 15½" wide x 9⅝" high x 14" deep. Net Weight: 43 pounds. Shipping Weight: 54 pounds.

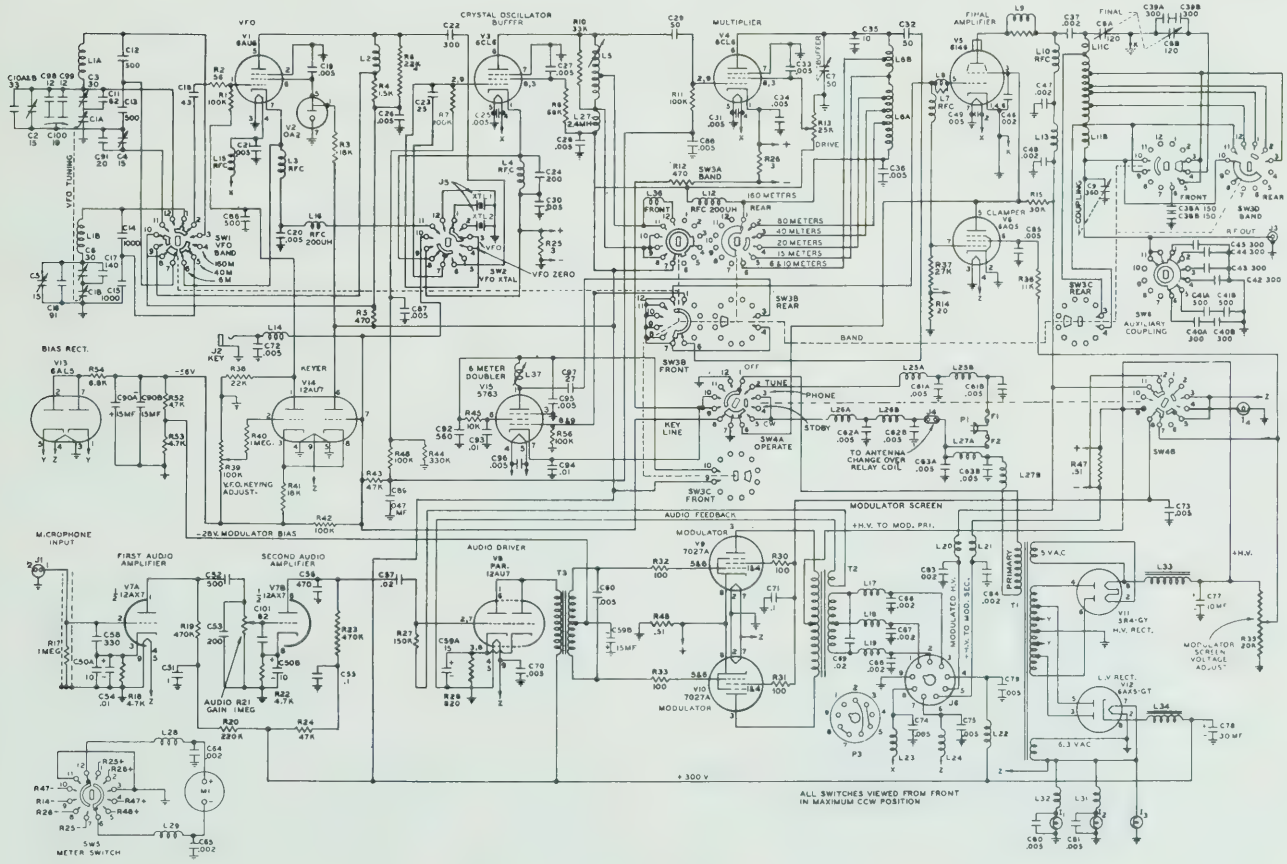


Cat. No. 240-162-1 Viking "Ranger II" Kit with tubes, less crystals, key and microphone.

AMATEUR NET $249.50

Cat. No. 240-162-2 Viking "Ranger II" wired and tested with tubes, less crystals, key and microphone ..... **$359.50 Amateur Net**

For information concerning Civil Defense Certification — See back cover.



Built-in provisions for use with SSB adapter

275 watts CW and SSB*; 200 watts phone!

Bandswitching 160 through 10 meters

* with an auxiliary SSB exciter

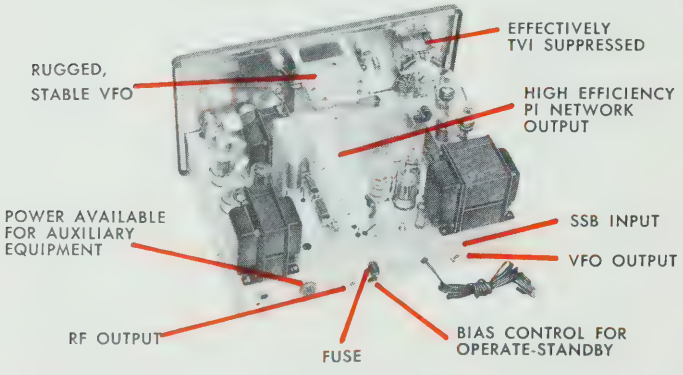
Viking "Valiant II"

Newly restyled — and offering many new operating and performance features, the "Valiant II" gives you outstanding flexibility and performance in a compact desk-top rig! Completely bandswitching 160 through 10 meters—delivers a full 275 watts input CW or SSB (with auxiliary SSB exciter or the new Viking SSB Adapter) and 200 watts AM! Low level audio clipping prevents overmodulation and increases modulation level and intelligibility for increased communications power. Differentially temperature compensated VFO operates in the 1.75 to 2 mc. and 7.0 to 7.45 mc. ranges — provides the extreme stability necessary for peak SSB operation. High efficiency pi-network tank circuit will match loads from 50 to 600 ohms and tunes out large amounts of reactance — final tank coil is silver-plated. Other features: complete TVI suppression; timed sequence (grid block) keying; high gain push-to-talk audio system for use with high impedance crystal or dynamic microphones; built-in low pass audio filter; self-contained power supply; and control mode switching.

As an exciter, the "Valiant II" will drive any of the popular kilowatt level tubes, and will provide a high quality speech driver system for high powered modulators. The 9-pin receptacle on the rear of the transmitter brings out TVI filtered control and audio leads for exciter operation . . . Also permits the "Valiant II" to be used as a filament and plate power source, as well as a modulator for auxiliary equipments such as a VHF transmitter.

SSB OPERATION —New in the "Valiant II" are provisions for plug-in SSB operation with no internal modifications necessary. Rear panel coax fittings are provided for VFO output and SSB input, and a 5-pin plug, also located on the rear panel, provides connections for remote control of the final amplifier bias and VFO keying through the VOX control of the SSB adapter.

FREQUENCY CONTROL — The "Valiant II" may be operated with built-in VFO or crystal control. VFO features differential temperature compensation for extreme stability — each band has separate band spread calibration. Dual tank circuit operates on 1.7 to 2.0 and 7.0 to 7.45 mc with separate compensation for each frequency range. Accurate and smooth tuning control is possible with the 6 to 1 planetary drive mechanism. Plexiglass dial is edge-lighted, plexiglass pointer is positioned to insure a minimum of parallax. Each band is divided into precise 10 KC increments for accurate dial readings and interpolation.



TUNING — The basic tuning controls of the "Valiant II" are located on the VFO dial escutcheon. QSY within the phone or CW portion of a band is usually possible by merely changing the VFO frequency setting. Larger frequency excursions will require a simple touch up of the exciter tuning, loading, and dipping the final.

OUTPUT CIRCUIT — Efficient pi-network tank circuit with a silver plated inductor is used in the final amplifier. Designed to handle 50 to 600 ohm resistance antenna loads, it will also tune out large amounts of reactance. Three 6146 tubes are used in the final amplifier. RF output is available through a standard SO-239 coaxial connector on the rear of the chassis.

AUDIO SYSTEM — The "Valiant II" has a high gain audio circuit which provides reserve gain for use with high impedance crystal or dynamic microphones and features push-to-talk control. Low level audio clipping prevents over modulation and increases average modulation level and intelligibility. Built-in low audio filter restricts the audio range to 3500 CPS, thus providing maximum communication effectiveness with minimum bandwidth.

TIMED SEQUENCE KEYING — This highly flexible keying system applies wave shaping to the keyed amplifier stages for perfect "make" and "break" of your keyed signal. Signal clicks and chirps are eliminated, yet the "break-in" advantages of a keyed VFO are retained.

TVI SUPPRESSION — Completely TVI suppressed, the "Valiant II" cabinet is electrically sealed with flexible monel braid on the inside of the front panel and large cabinet overlap — a cup type shield seals the meter. Power line and relay jack have double "L" type filters — all auxiliary socket, meter, key, and dial lamp leads have "L" filter networks. Interior harness leads and filaments are by-passed. Careful by-passing of the special circuit techniques minimize harmonics in the output circuit.

POWER SUPPLIES — Self-contained high voltage power supply uses choke input filtering — delivers 620 volts at 500 ma. Self-contained low voltage power supply will deliver 300 volts at 90 ma and 6.3 volts AC at 6 amps. A separate relay jack provides 115 VAC for antenna change over and control relays, and is energized by the "operate" switch on the front panel or the push-to-talk circuit. Two VR-105 voltage regulators are used to regulate the final amplifier screen voltage in SSB operation and the modulator screen voltage during AM operation. VFO screen voltage is regulated by an OA2 voltage regulator.

SPECIFICATIONS

FREQUENCY RANGE:
160, 80, 40, 20, 15, and 10 meters

POWER REQUIREMENTS:
105-120 V AC, 50-60 cycles, single phase

POWER INPUT:
275 Watts Continuous Wave
275 Watts Single Sideband (With auxiliary SSB exciter or Viking SSB Adapter)
200 Watts Amplitude Modulated Phone

FUSE PROTECTION:
Transmitter fuses are located in the 115 V. power plug. Separate internal fuse furnishes protection for low voltage power transformer and associated components.

TUBE COMPLEMENT

6AU6—Variable Frequency Oscillator
0A2—VFO Screen Voltage Regulator
6CL6—Crystal Oscillator/VFO Isolator
5763—R.F. Driver
6146—Parallel Final Amplifier, Bridge Neutralized (3)
12AX7—Cascade Speech Amplifier
6AL5—Audio Clipper
6C4—Audio Amplifier
12AU7—Parallel Audio Driver
6146—Push-Pull Class AB2 Modulator (2)
12AU7—Timed Sequence Keyer
6AQ5—Clamper
866A—High Voltage Rectifiers (2)
5V4G—Low Voltage Rectifier
6BY5GA—Bias Rectifier
VR-105—Screen Voltage Regulators (2)

The Viking Valiant II is available completely wired and tested or as an easy to assemble kit. The 18 gauge steel cabinet is finished in attractive two-tone gray metallic, with maroon nomenclature. The VFO and band switching knobs are maroon plastic, with the remaining controls being of solid machined aluminum. Complete kit includes assembly instruction, photographs, diagrams and step-by-step wiring directions. Wiring harness, all necessary hardware furnished — no drilling or metal work necessary. Dimensions: 21" wide x 11½" high x 14" deep. Net Weight: 73 lbs. Shipping Weight: 83 lbs.

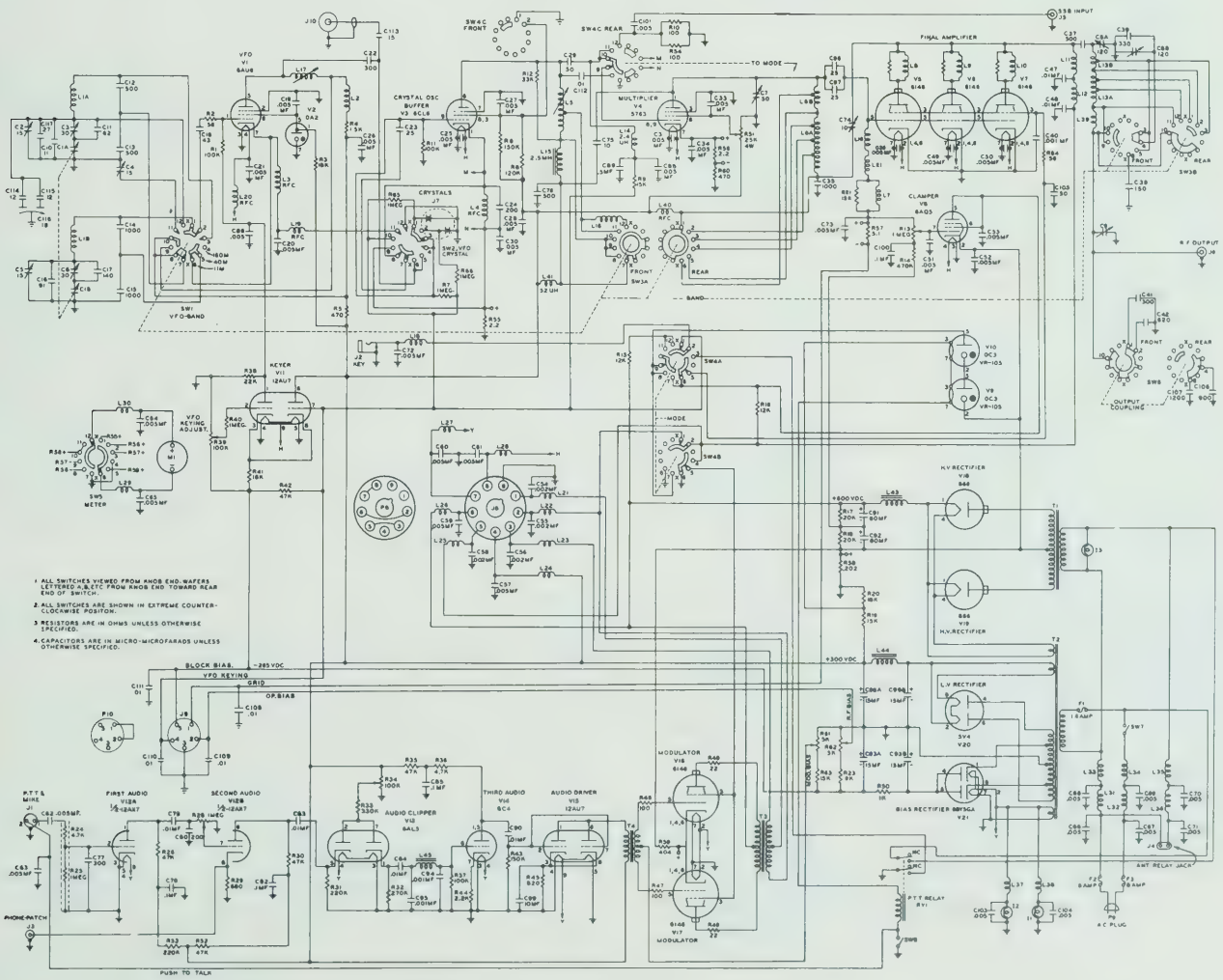
Cat. No. 240-105-1 Viking "Valiant II" Kit with tubes, less crystals

AMATEUR NET **$375.00**

Cat. No. 240-105-2 Viking "Valiant II" wired and tested with tubes, less crystals

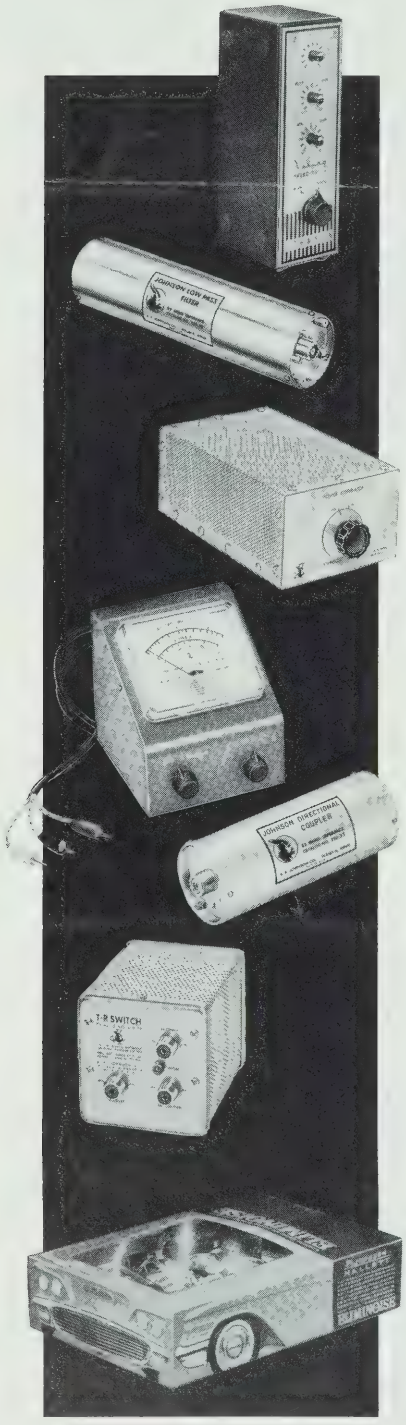
$495.00 AMATEUR NET

For information concerning Civil Defense Certification — See back cover.



for every
amateur operator

Johnson Station Accessories



"PHONE PATCH" — Compact, automatic HYBRID-transformer type unit provides push-to-talk or manual operation in addition to voice control (VOX) for SSB, DSB or AM. Adjustable "line null" control — separate gain controls for transmitter and receiver inputs. In "patch" position receiver speaker is de-energized and audio is switched to telephone handset for undistorted, hum-free audio response. Effectively shielded — RF filtering and bypassing prevents RF feedback from telephone line. Easy to install and operate. Dimensions: 2" wide, 6" high, 2½" deep. Shipping Weight: 3 lbs.
Cat. No. 250-46 Viking "Phone Patch," wired and tested . . . . . **$25.00 Amateur Net**

LOW PASS FILTER — Handles more than 1000 watts RF — 75 db or more attenuation of harmonic and spurious frequencies above 54 mcs. — less than .25 db insertion loss. Case designed for ready accessibility and insulated, fixed capacitors are replaceable. SO-239 coaxial connectors at input and output terminals. Not for use on 6 meters. Dimensions: 9" long, 2 5/16" diameter. Shipping Weight: 3 lbs.
Cat. No. 250-20 52 ohms impedance, wired and pre-tuned . . . . . **$14.95 Amateur Net**
Cat. No. 250-35 72 ohms impedance, wired and pre-tuned . . . . . **$14.95 Amateur Net**

ATTENUATORS — These "T-pad" attenuators provide 6 db. attenuation with required power dissipation to permit various units to serve as exciters for the Viking "Thunderbolt" linear Amplifier. Equipped with SO-239 coaxial receptacles for input and output connections. Front panel dial instantaneously switches attenuator in or out of circuit. Dimensions: 4½" wide, 3⅛" high, 9⅛" deep. Net Weight: 1 lb. Shipping Weight: 2 lbs.
Cat. No. 250-42-1 — Use with "Ranger" or similar unit. Max. Power Dissipation: 45 watts. Max. Power Input: 60 watts. 350 ohms input and output impedance. Provision for adding 75 watt light bulb for use with "Viking II" or other transmitter/exciter of similar power. Max. Power Dissipation with light bulb: 110-120 watts. . . . . **$21.50 Amateur Net**
Cat. No. 250-42-3 — Use with HT-32 or similar unit. Max. Power Dissipation: 45 watts. Max. Power Input: 70 watts. 50 ohms input and output impedance. . . . . **$21.50 Amateur Net**

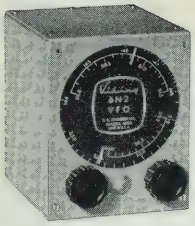
DIRECTIONAL COUPLER AND INDICATOR — Provides continuous reading of SWR and relative power in transmission line. May be permanently installed in 52 ohm coaxial line — readily handles maximum legal power as specified by FCC for amateur service. Standard tip jacks permit use of a commercial multimeter as indicating instrument — reference sheets with curves for popular multimeter ranges supplied with each coupler. Indicator is 0-100 micro-ammeter calibrated directly in SWR and relative power. Incident or reflected power readings selected instantly by front panel switch. Second front panel control permits easy adjustment and calibration of meter. Coupler equipped with SO-239 coaxial fittings. Dimensions: 6¼" long, 2 5/16" diameter. Shipping Weight: 2 lbs. Indicator equipped with 6-ft. leads and male plugs. Dimensions: 4" wide, 4⅜" high, 4¼" deep. Shipping Weight: 4 lbs.
Cat. No. 250-37 Directional Coupler, wired and tested . . . . . **$11.75 Amateur Net**
Cat. No. 250-38 Indicator, wired and tested . . . . . **$25.00 Amateur Net**

T-R SWITCH — Provides instantaneous high-efficiency electronic antenna switching. Exclusive double-gated circuitry with 6BL7 dual triode for excellent receiver isolation. Gain: 2 db. at 30 mcs; 6 db. at 3.5 mcs. Handles peak power capability of linear amplifiers — rated at 4,000 watts peak power. Instantaneous break-in on SSB, DSB, CW or AM. Will not affect transmission line SWR and provides effective impedance match to most receivers through 3 to 30 mc. range. Tip jack facilitates connection to internal RF probe to drive oscilloscope or other monitoring device. With SO-239 coaxial fittings. Dimensions: 4¼" wide, 4⅜" high, 5⅜" deep. Net Weight: 4 lbs. Shipping Weight: 5 lbs.
Cat. No. 250-39 T-R Switch, wired and tested with tube and power supply . . . . . **$29.95 Amateur Net**

"ELIMINOISE" IGNITION SHIELDING KIT — Suppresses both conducted and radiated interference — places an effective noise blanketing shield around the source of electric noise to increase two-way operating range and improve performance. Easy to install using ordinary hand tools. May be transferred from one vehicle to another with same number of cylinders. Contains easy to follow instructions; chrome-plated spark plug shields; distributor cap shield and coil shield with integral filter capacitor; spark plug cable shielding; and all necessary hardware. Shipping Weight: 4 lbs.
Cat. No. 250-821-1 (Model 60) 6 Cylinder Kit . . . . . **$29.95 Amateur Net**
Cat. No. 250-821-2 (Model 80) 8 Cylinder Kit . . . . . **$38.50 Amateur Net**

ALTERNATOR-GENERATOR/REGULATOR SUPPRESSION KIT — Designed as supplement to the "Eliminoise" Kit for especially noisy vehicles. Contains illustrated instructions and all necessary capacitors, grounding straps, shielded cable harness and hardware. Shipping Weight: 2 lbs.
Cat. No. 250-801-2 Alternator-Generator/Regulator Suppression Kit . . . . . **$11.60 Amateur Net**

6 and 2 Meter Accessories



"6N2" VFO — This compact variable frequency oscillator replaces 8 to 9 mc. crystals in frequency multiplying 6 and 2 meter transmitters — including types using overtone oscillators. Temperature compensated and exceptionally stable . . . 6BH6 series tuned oscillator; OA2 voltage regulator. Rigid, double-bearing ceramic insulated tuning capacitor; ceramic insulated air dielectric trimmers and ceramic coil form. Output Freq. Range: 7.995 to 9.010 mc. Edge-lighted plexiglas dial calibrated from 144 to 148; 50 to 51.5; 51.5 to 53; and 53 to 54 mc. for maximum bandspread. Power Requirements: 6.3 VAC at .3 amps and 250 to 300 VDC at 10 ma — easily obtained from transmitter with power cable and plug furnished. Available wired and tested or as easy-to-assemble kit. Heavy aluminum cabinet finished in attractive maroon and grey with green nomenclature. Dimensions: 4" wide, 5" high, 4½" deep. Net Weight: 2 lbs. Shipping Weight: 3 lbs.

Cat. No. 240-133-1 "6N2" VFO kit with tubes, pre-calibrated dial, and detailed assembly and operating instructions. **$34.95 Amateur Net**

Cat. No. 240-133-2 "6N2" VFO Wired and Tested, with tubes and pre-calibrated dial. . . . . **$54.95 Amateur Net**

"6N2" Converter — Excellent image and I.F. rejection due to double-tuned, over-coupled, interstage circuits. Instant front panel bandswitching from "normal" receiver operation to 6 or 2 meters. Compact . . . excellent stability . . . maximum sensitivity and low noise figure. Cascode RF amplifier circuit utilizes 6ES8 dual triode with "Frame Grid". Fused, built-in transformer-type power supply. Available wired and tested or as easy-to-assemble kit. Cabinet finished in attractive maroon and grey with green nomenclature. Dimensions: 2¾" wide, 5" high, 12" deep. Net Weight: 2 lbs. Shipping Weight: 5 lbs.

"6N2" Converter Kit with tubes . . . . . **$59.95 Amateur Net**

Cat. No.	Range	Cat. No.	Range
250-43-1	26 to 30 mcs.	250-43-3	14 to 18 mcs.
250-43-2	28 to 30 mcs.	250-43-4	30.5 to 34.5 mcs.

"6N2" Converter, Wired and Tested with tubes . **$89.95 Amateur Net**

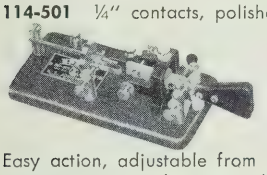
Cat. No.	Range	Cat. No.	Range
250-43-12	26 to 30 mcs.	250-43-32	14 to 18 mcs.
250-43-22	28 to 30 mcs.	250-43-42	30.5 to 34.5 mcs.

Keys and Practice Sets

DELUXE SEMI-AUTOMATIC KEYS

Adjustable from lowest to highest speeds, this handsomely finished semi-automatic key has a smooth, easy action. Vibrator, posts, circuit closing switch, and all machine parts heavily chrome plated. Five adjustments with lock nuts — molded plastic paddles adjust separately to best height. Steel base 6¼" x 3½" x ½" — complete with adjustable weight and rubber feet.

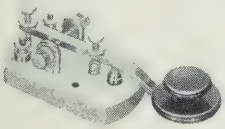
Cat. No.		Net Price
114-500	⅛" contacts, black wrinkle base	$20.30
114-501	¼" contacts, polished chrome base	25.50



SPECIAL SEMI-AUTOMATIC KEY

Many operating features — attractively finished, black wrinkle enamel base. All hardware and vibrator heavily chrome plated. Same vibrator as on deluxe key. Easy action, adjustable from lowest to highest speeds. ⅛" coin silver contacts — circuit closing switch — rubber mounting feet.

114-520 Special Model, Semi-Automatic **$17.75**



HEAVY DUTY KEYS

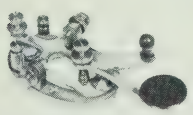
Heavy die cast base, chrome plated key arm. Well insulated for heavy duty service. Large ¼" coin silver contacts. Improved Navy-type knob. Adjustable steel bearings and spring design give light keying touch.

114-320 Black wrinkle enamel base **$4.95**
114-321 Polished chrome plated base **5.85**

STANDARD KEYS

Heavy die cast base. Smooth adjustable bearings. New Johnson "cushion-contact" design provides smooth keying action. Provision for plugging in semi-automatic keys. ⅛" coin silver contacts. A high quality key at a low cost.

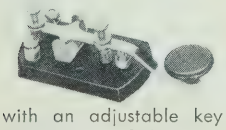
114-310 Black wrinkle, no switch **$3.50**
114-310-3 Black wrinkle with switch **4.25**
114-311 Chrome plated, no switch **5.50**
114-311-3 Chrome plated with switch **6.50**



HIGH SPEED STANDARD KEYS

Fully adjustable spring tension, contact spacing and bearings. Brass base and binding posts — instrument lacquer finish. .072" platinor contacts.

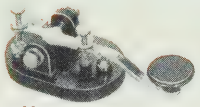
114-100 R48 Key, satin brass, no switch **$6.95**
114-100-3 M100 Key, satin brass with switch **7.95**



PRACTICE KEY

An inexpensive practice key — perfect in design for the average beginner. All the metal parts are nickel plated. Furnished with an adjustable key arm, spring and smooth action bearings. Contacts are of ⅛" coin silver.

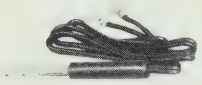
114-300 Molded phenolic base **$2.40**



PHENOLIC BASE KEYS

High quality key with adjustable bearings. Improved spring-pigtail connection. ⅛" coin silver contacts — nickel plated metal parts.

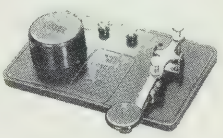
Cat. No.		Net Price
114-301	Molded phenolic base, no switch	$2.50



CORD AND WEDGE

Cord and wedge for easy attachment of semi-automatic key across circuit-closing switch of a standard hand key. Used almost universally by railroad telegraphers — ideal for amateur service where both hand key and semi-automatic are used.

114-380 Cord and wedge **$1.15**



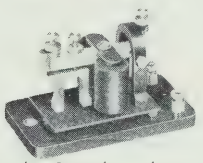
PRACTICE SET

Constant frequency buzzer and key on a 4" x 6" molded bakelite base. Buzzer tone is fully adjustable. Coin silver contacts. Uses two dry cells or "C" battery. Connect singly or in pairs for code practice.

114-450 Practice Set **$5.25**

Buzzer only as used on set above.

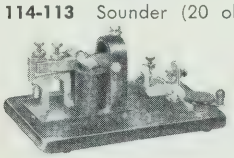
114-400 Buzzer **$1.85**



TELEGRAPH SOUNDER

Designed for instant response, brass sounder provides clear, resonant tone. Steel bar frame, black enamel finish. Brass bridge and adjustment screws, instrument lacquer finish. Sounder plate is black lacquered steel. Mahogany finished wood base, brass binding posts and rubber mounting feet.

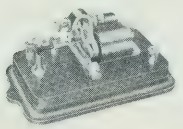
114-112 Sounder (4 ohms) **$11.50**
114-113 Sounder (20 ohms) **11.95**



LEARNER SET

Telegraph practice set. Bar frame steel, brass bridge and adjustment screws. Brass lacquer finish. Brass sounding bar — black lacquered steel sounder plate. Adjustable, brass finished key arm. Mahogany finished wood base, brass binding posts, rubber feet.

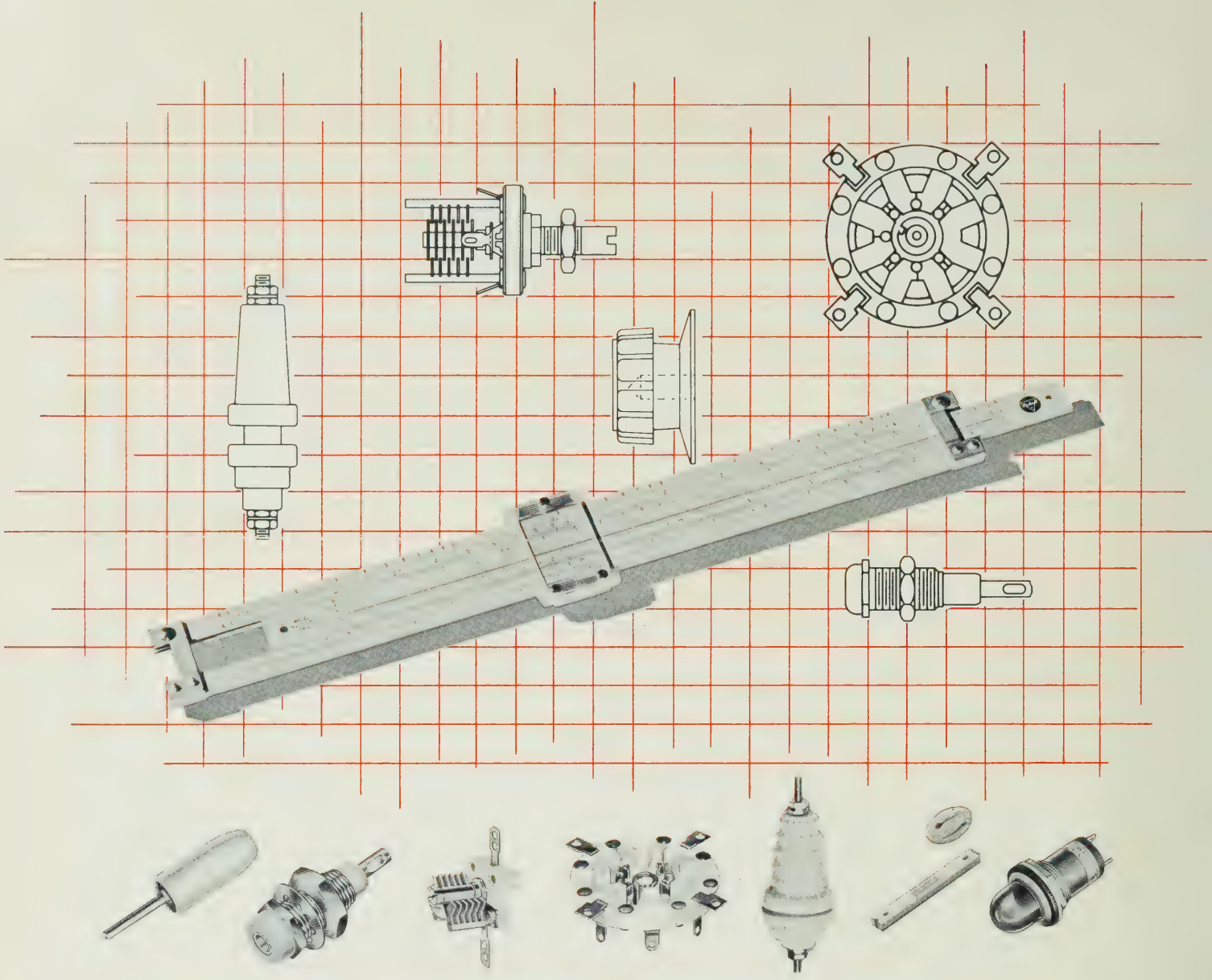
114-110 (4 ohms) **$15.50**
114-111 (20 ohms) **15.50**



PONY RELAY

Polished, plated steel armature — all other metal parts brass with lacquer finish. Heavy duty magnets. Mahogany finished wood subbase — cast iron black enamel base.

114-105 (20 ohms) **$17.50**



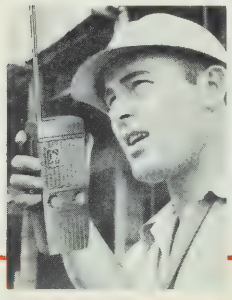
Time after time amateurs choose Johnson components

The E. F. Johnson Company also manufactures a complete line of electronic components for those of you who prefer to design and build your own transmitting equipment and accessories.
A wide range of inductors is available for all bands from 160 to 6 meters. Continuously variable inductors in 3 sizes are made for a variety of applications.

Variable capacitors, from the diminutive "U" sizes to the rugged "C" capacitors offer the designer a complete line to choose from.
Tube sockets, nylon connectors, insulators and hardware are also available . . . all built to the standards which have made the E. F. Johnson Company a leader in component manufacture.

free catalog

For pricing and descriptive information on the complete Johnson line of electronic components, write for your free copy of our latest general products catalog



CIVIL DEFENSE CERTIFICATION

The Johnson amateur equipment on the preceding pages marked "CD CERTIFICATION – See back cover," will qualify for matching funds, having been certified by the E. F. Johnson Company as meeting OCDM specifications on factory wired and tested models for crystal controlled operation. Copies of the official description of necessary accessories and certification are available on request.

OTHER JOHNSON EQUIPMENT

In addition to the "Viking" Amateur Radio line, the E. F. Johnson Company manufactures Industrial Radio Equipment; Citizens Radio Equipment; and Selective Radio Paging Equipment. For full details – contact your Johnson distributor.

E. F. JOHNSON COMPANY
WASECA, MINNESOTA, U.S.A.

Catalog No. 965 A Form No. 965M065 Printed in U.S.A.

INSTALLATION AND OPERATING INSTRUCTIONS

JOHNSON 250-20 LOW PASS FILTER

FOR TVI SUPPRESSION

A low pass filter consisting of four full sections capable of handling more than 1000 watts RF, amplitude modulated. Cut-off frequency is 45 mcs. with "M" derived end sections adjusted to provide maximum attenuation at 57 mcs., the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB.

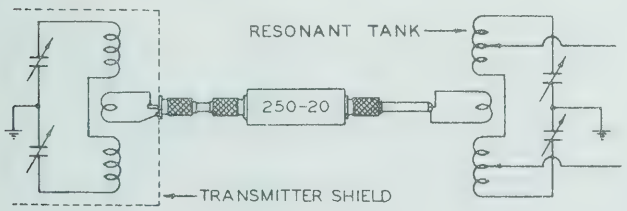
Characteristic impedance of the filter is 52 ohms. When properly terminated, the maximum voltage developed across capacitors is nominal, even at 1 KW power. In designing the JOHNSON Low Pass Filter, consideration was given the fact that the RF voltage could rise to extremely high values if the load were accidentally removed. Therefore, to enable the user to service the unit, the interior of the filter case has been made readily accessible and fixed capacitors have replaceable Teflon insulation.

Standard SO-239 coaxial connectors are used for input and output terminals. The unit is completely assembled, pre-tuned and equipped with convenient mounting hardware.

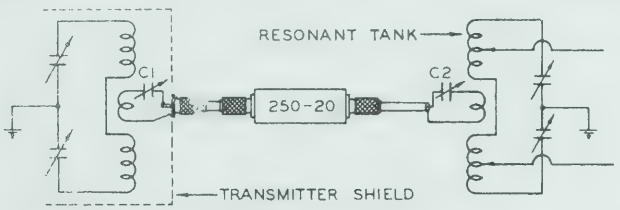
The 250-20 JOHNSON Low Pass Filter is intended for use with a 52 ohm coaxial transmission line at modulated power levels up to 1,000 watts. The standing wave ratio on the line should be as near unity as possible and not greater than 1 1/2 to 1. With higher standing wave ratios, both power handling capability and harmonic attenuation are reduced. If the antenna system in use is fed with 52 ohm coaxial cable, the filter is merely inserted in the line, the connectors serving to ground the case to the outside shield of the coax. At frequencies below cutoff, the filter will introduce negligible discontinuity into the line.

It is assumed that the transmitter, with which the filter is being used, has been previously shielded and equipped with a power line filter. The transmission line should be bonded to the transmitter shield at the point where it emerges, otherwise, due to stray coupling there may be RF current flowing on the outside of the transmission line. Harmonics contained in this RF current will flow around and not be attenuated by the low pass filter. Use of an SO-239 connector at this point provides a convenient means of bringing out power while keeping shielding intact.

With the many amateur transmitters, using low impedance links to couple to balanced antenna systems, some type of antenna coupler is required and use of a fixed impedance filter does not unduly complicate antenna loading. The antenna coupling system shown below is simple and quite flexible.



Tuning of the coupler can be made quite broad by making the L/C ratio as high as possible (low "Q") while still permitting the desired loading. Inductive reactance of the links may make it impossible to reduce the SWR of the transmission line to or below 1 1/2 to 1. If so, both link circuits can be made series resonant by adding capacitors C_1 and C_2 as shown below.



The sections of coaxial line between the transmitter output and the low pass filter and between the low pass filter and antenna tuner should be as short as possible. Electrical quarter waves or multiples should be avoided. An RF bridge, such as the JOHNSON catalog number 250-24 Standing Wave Bridge, will prove invaluable both for initial set-up and for operational checks.

HELPFUL REFERENCES:

"Coupling the Transmitter to the Line", pp. 313-318 ARRL Handbook, 1955

George Grammer, "Eliminating TVI with Low Pass Filters" QST, February - March, 1950

NOTICE

The JOHNSON 250-20 Low Pass Filter has been carefully tuned at the factory using precise measuring equipment. The adjustable elements are sealed with glyptal and will require no further adjustment unless teflon capacitor dielectric discs are changed.

E. F. JOHNSON COMPANY
WASECA, MINNESOTA

INSTALLATION AND OPERATING INSTRUCTIONS

JOHNSON 250-20 LOW PASS FILTER

FOR TVI SUPPRESSION

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It is assumed that the transmitter, with which the filter is being used, has been previously shielded and equipped with a power line filter. The transmission line should be bonded to the transmitter shield at the point where it emerges, otherwise, due to stray coupling there may be RF current flowing on the outside of the transmission line. Harmonics contained in this RF current will flow around and not be attenuated by the low pass filter. Use of an SO-239 connector at this point provides a convenient means of bringing out power while keeping shielding intact.

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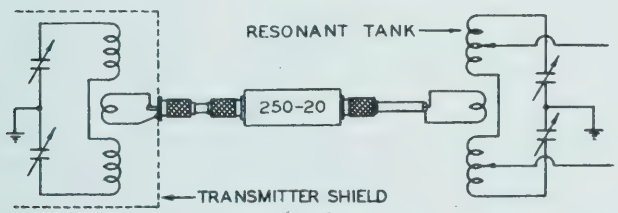
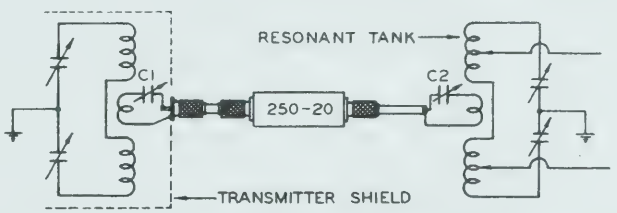


Tuning of the coupler can be made quite broad by making the L/C ratio as high as possible (low "Q") while still permitting the desired loading. Inductive reactance of the links may make it impossible to reduce the SWR of the transmission line to or below 1 1/2 to 1. If so, both link circuits can be made series resonant by adding capacitors C_1 and C_2 as shown below.



The sections of coaxial line between the transmitter output and the low pass filter and between the low pass filter and antenna tuner should be as short as possible. Electrical quarter waves or multiples should be avoided. An RF bridge, such as the JOHNSON catalog number 250-24 Standing Wave Bridge, will prove invaluable both for initial set-up and for operational checks.

HELPFUL REFERENCES:

"Coupling the Transmitter to the Line", pp. 313-318 ARRL Handbook, 1955

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NOTICE

The JOHNSON 250-20 Low Pass Filter has been carefully tuned at the factory using precise measuring equipment. The adjustable elements are sealed with glyptal and will require no further adjustment unless teflon capacitor dielectric discs are changed.

E. F. JOHNSON COMPANY

WASECA, MINNESOTA

LOW PASS FILTER

design file

MODEL 250-20 72

INSTALLATION AND OPERATING INSTRUCTIONS

A low pass filter consisting of four full sections capable of handling more than 1000 watts RF amplitude modulated or 5,000 watts peak SSB. Cut-off frequency is 45 mcs. with "M" derived end sections adjusted to provide maximum attenuation at 57 mcs., the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB.

Characteristic impedance of the filter is 52 ohms. When properly terminated, the maximum voltage developed across capacitors is nominal, even at 1 KW average power. In designing the JOHNSON Low Pass Filter, consideration was given the fact that the RF voltage could rise to extremely high values if the load were accidentally removed. Therefore, to enable the user to service the unit, the interior of the filter case has been made readily accessible and fixed capacitors have replaceable insulation.

Standard SO-239 coaxial connectors are used for input and output terminals. The unit is completely assembled, pre-tuned and equipped with convenient mounting hardware.

The 250-20 JOHNSON Low Pass Filter is intended for use with a 52 ohm coaxial transmission line at modulated power levels up to 1,000 watts. The standing wave ratio on the line should be as near unity as possible and not greater than 1½ to 1. With higher standing wave ratios, power handling capability is reduced. If the antenna system in use is fed with 52 ohm coaxial cable, the filter is merely inserted in the line, the connectors serving to ground the case to the outside shield of the coax. At frequencies below cutoff, the filter will introduce negligible discontinuity into the line.

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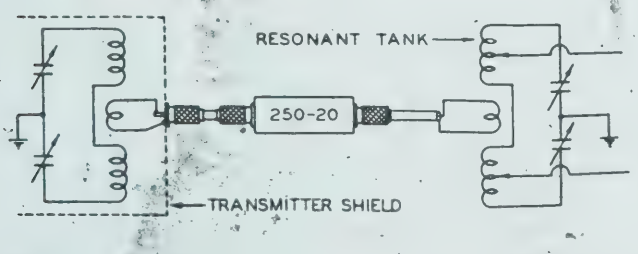

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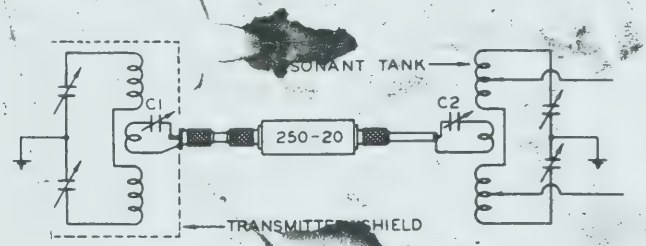

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E. F. Johnson Company

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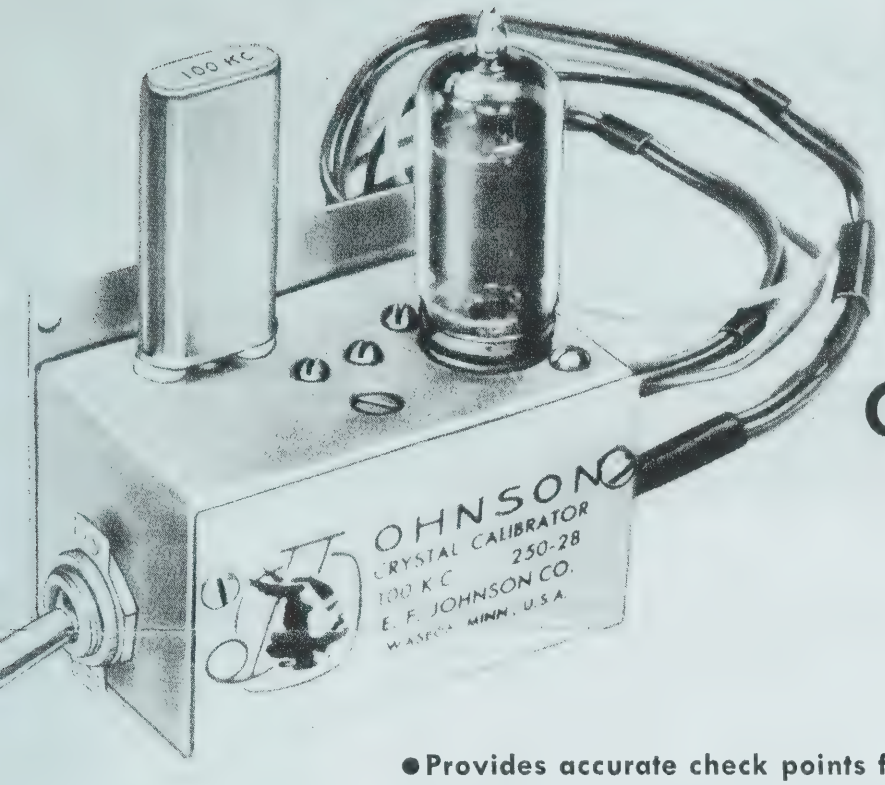
Johnson



100 KC CRYSTAL CALIBRATOR

● Provides accurate check points for transmitting frequency — for calibrating receivers and VFO's

Extremely compact, this tiny crystal calibrator provides accurate 100 kc check points to 55 mc for calibrating receivers and VFO's or for monitoring a transmitted signal. High quality, hermetically sealed military type crystal is superior to those usually found in a unit of this type. Circuit uses a 6BH6 tube and has an adjustable ceramic trimmer capacitor for exact zero beating of the crystal to WWV or other standard.

Extremely low power requirements may be taken from receiver or other source—unit requires only 6.3 volts at .15 amps. and 150 to 300 volts at 2 ma. Special clips are provided for the tube prongs of equipment furnishing power take-off. Power cable and extension leads are included to permit remote mounting of switch. Furnished wired and tested with 6BH6 tube and crystal.

The 100 kc crystal calibrator measures only 1⅝" x 2½" x 1½", and chassis may be mounted inside the receiver cabinet or in any convenient spot. (Overall height to top of tube is 3⅜").

Cat. No. 250-28. Johnson 100 kc Crystal Calibrator complete with tube, crystal, power cable and extension lead.

$17.25
AMATEUR NET

E. F. JOHNSON COMPANY • WASECA, MINNESOTA

The JOHNSON Crystal Calibrator is a highly stable frequency standard employing a 100 Kilocycle quartz crystal oscillator. The oscillator utilizes a 6BH6 Pentode type vacuum tube operating in a highly non-linear region which provides useful output up to 55 Megacycles at 100 Kilocycle increments throughout the range of 100 Kilocycles to 55 Megacycles. A small trimmer capacitor adjustment is provided in the oscillator making it possible to adjust the crystal frequency to zero beat with the standard frequency transmissions of WWV or any other frequency standard. Crystal Calibrator units of this type are universally used with communication receivers to provide frequency markers, and for this reason, the JOHNSON Crystal Calibrator has been compactly designed for universal mounting within communication receivers. The Crystal Calibrator thus becomes an integral part of the communications receiver and avoids the disadvantages of units which are separated from the receiver. The very small power requirements of the JOHNSON Crystal Calibrator, 6.3 Volts at .15 Amperes and 150 to 300 Volts D.C. at 2 Milliamperes, are taken from the communications receiver through the use of convenient tube prong clips supplied with the unit. No receiver circuit or wiring changes are required to either install or utilize the JOHNSON Crystal Calibrator.

MOUNTING

Figures 1 (single-hole mounting) and 2 (remote mounting) show the overall physical and mounting dimensions of the calibrator. The calibrator may be single-hole mounted by means of the toggle switch shank or may be mounted by means of the two chassis holes provided for this purpose. As received, the calibrator is provided for remote mounting, that is, the toggle switch is attached to the calibrator by means of long wire leads thus permitting the toggle switch to be mounted on the front panel of the communications receiver with the calibrator at a more convenient remote location. If sufficient panel mounting space is available in the receiver, the toggle switch may be mounted within the calibrator and in turn the assembly directly attached to the panel. A ½ inch diameter hole must be drilled in the panel to accept the on-off toggle switch. In mounting the switch, the "ON-OFF" indicator plate should be placed over the switch shank after the switch has been placed in the ½" hole, and the nut securely tightened. When the Crystal Calibrator chassis is remotely located from the panel, it is desirable to place it away from any local heat sources such as power transformers, power output or rectifier tubes. Two 5/32 inch diameter holes should be drilled to mount the calibrator chassis at the chosen remote point. Neatness of installation may be improved by carefully training excess lead length to the toggle switch or by removing excess length of lead and resoldering to the switch.

POWER LEAD CONNECTIONS

Special dual purpose solder lug and tube pin clips have been provided to make connection to the receiver power as convenient as possible. It will be observed that these double ended clips fit snugly over either a standard octal tube pin or the 7 and 9 pin miniature tube pins. After attachment to the power leads, the clips are slipped under the power output tube, the tube reinserted in its socket and the installation for power is complete. In most receivers the screen of the audio or power output stage is at B+ supply potential and therefore serves as a good tie point for B+ power for the calibrator. In order to assist in the installation of the calibrator, a tube basing diagram for the most popular output tubes is furnished in Figure 3. If the communication receiver utilizes a power output tube other than shown in Figure 3, reference should be made to one of the standard handbooks for basing diagram. The power leads are color coded. The two filament leads are green, the B+ lead red, and the ground lead black. Reference to Figure 4 will show that the tube pin clips are bent upward in respect to the tube to prevent rotation of the clip and possible shorting to an adjacent pin. The four power leads should be carefully and neatly trained from the Crystal Calibrator chassis to the power output socket and cut to appropriate length keeping in mind the fact that the tube pin clips will be bent upward to prevent rotation. The plastic insulation tubing should be cut into four equal lengths and a length slipped over each of the four power leads.

Connect and solder one of the tube pin clips to each of the power leads attaching the leads to the *small hole* in the clip when power is obtained from *octal* type tubes and in the *large hole* when power is obtained from *miniature* tubes. After soldering, the insulated tubing should be pushed down over the clip leaving exposed only the hole in the clip which is attached to the power output tube pin. Gauging the dimension from the tube pin to the side of the tube envelope, grasp the clip with long nose pliers and bend the clip at a right angle. This bend will "lock" the clip against the side of the tube envelope when it is slipped over the tube pin and prevent the possibility of shorts to adjacent pins. Carefully slip the clips over the proper tube pins and reinsert the power output tube in its socket. This completes the lead connections to the power source. The remaining unconnected orange lead is the RF output lead of the Crystal Calibrator and should be connected directly to the antenna terminal of the receiver. Reference to the schematic diagram, Figure 5, will show that the Crystal Calibrator output is connected through a small value of capacity thus permitting direct connection to the antenna terminal of the receiver. In the case of balanced receiver inputs, connection may be made to either of the antenna terminals. This completes the installation of the calibrator and it is now ready for use.

CALIBRATION AND USE

Tune the receiver to one of the standard frequencies of WWV, 2½, 5, 10, 15, 20, 25, or 30 Megacycles. Allow the receiver to warm up for a few minutes with the calibrator "OFF". Turn the calibrator switch "ON" and adjust the small trimmer capacitor next to the crystal socket to zero beat against the WWV carrier. It may be found easier to zero beat against WWV when the tone modulation is not present. The high stability of the JOHNSON Crystal Calibrator requires but relatively infrequent zero adjustment, usually holding frequency for many months without readjustment.

The calibrator is ready for use after "zeroing" against WWV (or any other *accurate* standard). Whenever the calibrator is turned "ON", markers or signals will appear at 100 kilocycle intervals throughout the receiver range. Various equipment such as test oscillators may in turn be calibrated against the calibrator standard.

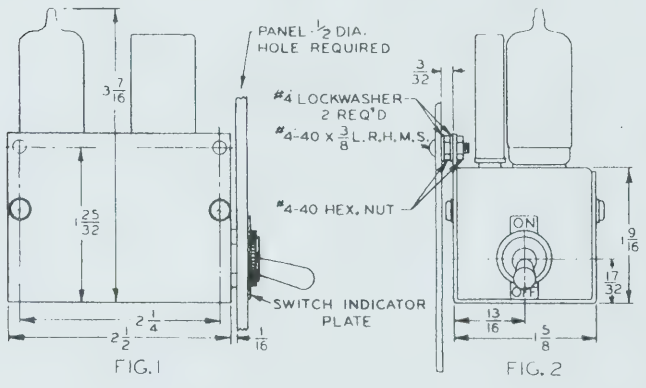
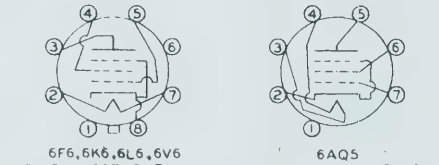


FIG. 1 FIG. 2



BASE DIAGRAMS FOR POPULAR AUDIO OUTPUT TUBES
FIG. 3

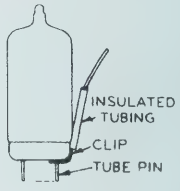


FIG. 4

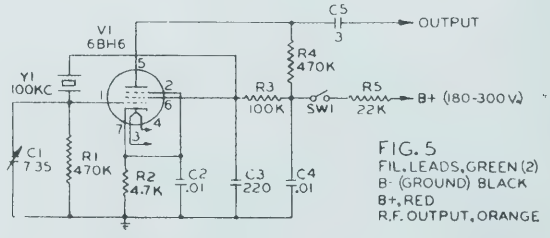


FIG. 5
FIL. LEADS, GREEN (2)
B- (GROUND) BLACK
B+, RED
R.F. OUTPUT, ORANGE

LOW PASS FILTER

design file

MODEL 250-20

72

INSTALLATION AND OPERATING INSTRUCTIONS

A low pass filter consisting of four full sections capable of handling more than 1000 watts RF amplitude modulated or 5,000 watts peak SSB. Cut-off frequency is 45 mcs. with "M" derived end sections adjusted to provide maximum attenuation at 57 mcs., the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB.

Characteristic impedance of the filter is 52 ohms. When properly terminated, the maximum voltage developed across capacitors is nominal, even at 1 KW average power. In designing the JOHNSON Low Pass Filter, consideration was given the fact that the RF voltage could rise to extremely high values if the load were accidentally removed. Therefore, to enable the user to service the unit, the interior of the filter case has been made readily accessible and fixed capacitors have replaceable insulation.

Standard SO-239 coaxial connectors are used for input and output terminals. The unit is completely assembled, pre-tuned and equipped with convenient mounting hardware.

The 250-20 JOHNSON Low Pass Filter is intended for use with a 52 ohm coaxial transmission line at modulated power levels up to 1,000 watts. The standing wave ratio on the line should be as near unity as possible and not greater than 1½ to 1. With higher standing wave ratios, power handling capability is reduced. If the antenna system in use is fed with 52 ohm coaxial cable, the filter is merely inserted in the line, the connectors serving to ground the case to the outside shield of the coax. At frequencies below cutoff, the filter will introduce negligible discontinuity into the line.

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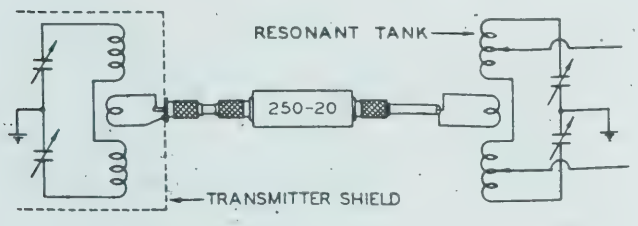

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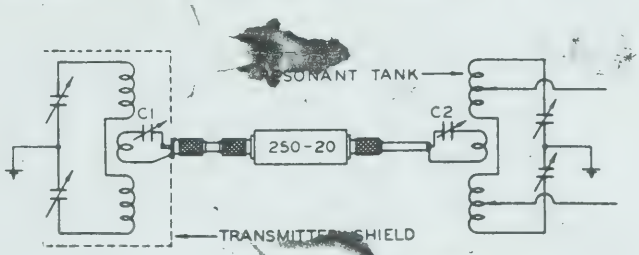

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E. F. Johnson Company

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LOW PASS FILTER

design file

MODEL 2520-20

INSTALLATION AND OPERATING INSTRUCTIONS

A low pass filter consisting of four full sections capable of handling more than 1000 watts RF amplitude modulated or 5,000 watts peak SSB. Cut-off frequency is 45 mcs. with "M" derived end sections adjusted to provide maximum attenuation at 57 mcs., the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB.

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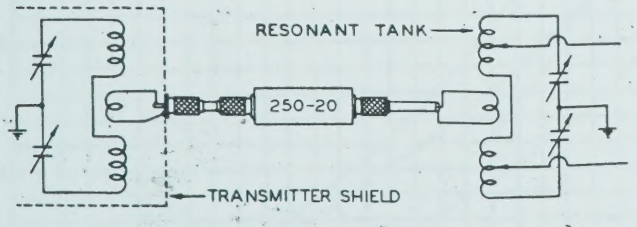

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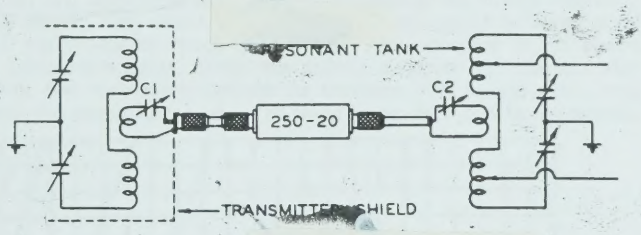

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OPERATING INSTRUCTIONS
JOHNSON SWR BRIDGE

Cat. No. 250-24

GENERAL DESCRIPTION

The JOHNSON SWR Bridge is an instrument designed primarily to measure the standing wave ratio on 52 ohm coaxial transmission lines. It can, with slight modification or additional equipment, be used to measure the s. w. r. on 70 ohm coaxial lines, the s. w. r. on open wire lines, the radiation resistance of unbalanced antennas and the r. f. resistance of non-inductive resistors. The bridge is also essential for the proper adjustment of an antenna coupler unit. It is not critical with respect to frequency and will give accurate measurements up to frequencies of 150 megacycles.

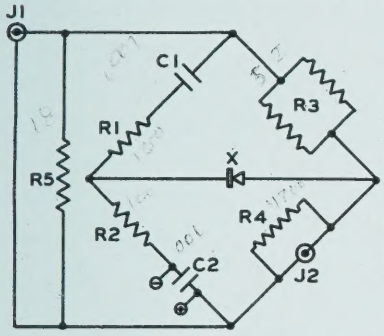

FIG. 1

PARTS LIST

Item	Part No.	Description
C1, C2	22.805	.001 MFD mica capacitor
R1, R2	22.888	100 ohm non-inductive resistor
R3	22.889	non-inductive resistor pair total 52 ohms
R4	22.802	4700 ohm non-inductive resistor
R5	22.887	18 ohm non-inductive resistor
J1, J2	22.746	83-1R receptacle
X	22.852	1N48 germanium diode

CIRCUIT:

The instrument consists of a bridge circuit as shown in Fig. 1. The ratio arms of the bridge are C_1R_1, C_2R_2, R_3 and the unknown impedance paralleled by R_4. The elements R_1, R_2, C_1 and C_2 are selected and matched resistors and capacitors. The two resistors of R_3 are selected units and are used as a standard for comparison with the unknown.

The 1N48 germanium crystal across the bridge, rectifies any r. f. voltage difference at the mid points of the two arms. This bridge unbalance current is read by connecting an external 0-1 ma. meter to the standard tip jacks provided on each side of capacitor C_2. The 4700 ohm resistor, R_4, across the output terminals provides a d. c. return when the bridge is used to measure "open circuit" impedances such as a dipole antenna. The resistor R_5 is across the input terminals (J_1) to improve the regulation of the r. f. power supplied to the bridge.

CALIBRATION CHART

The bridge calibration chart (Fig. 2) has two sets of curves for indicating the s. w. r. relative to meter readings for three types of meters. The 1.0 ma. curves are to be used with a 0-1 ma. milliammeter connected directly to the bridge. The 100 and 250 microampere curves are to be used with meters having 100 or 250 microampere full scale readings but only when used with the proper resistor in series with the positive meter lead. For approximately the same input power as required when a 0-1 ma. meter is used, the series resistor for a 100 microampere meter should be 4300 ohms and for a 250 microampere meter should be 2200 ohms.

OPERATION

A low power r. f. source, at the frequency of which the measurements are desired, is connected to the input terminals with the output terminals open. Caution must be observed in not applying more than one watt of power to avoid damaging the bridge elements and the meter. This input power should be carefully adjusted until the 0-1 milliammeter reads exactly full scale current which serves as the calibration point. Since the output is open, this current also represents the maximum unbalance between the bridge arms and therefore the maximum s. w. r. or impedance that can be measured.

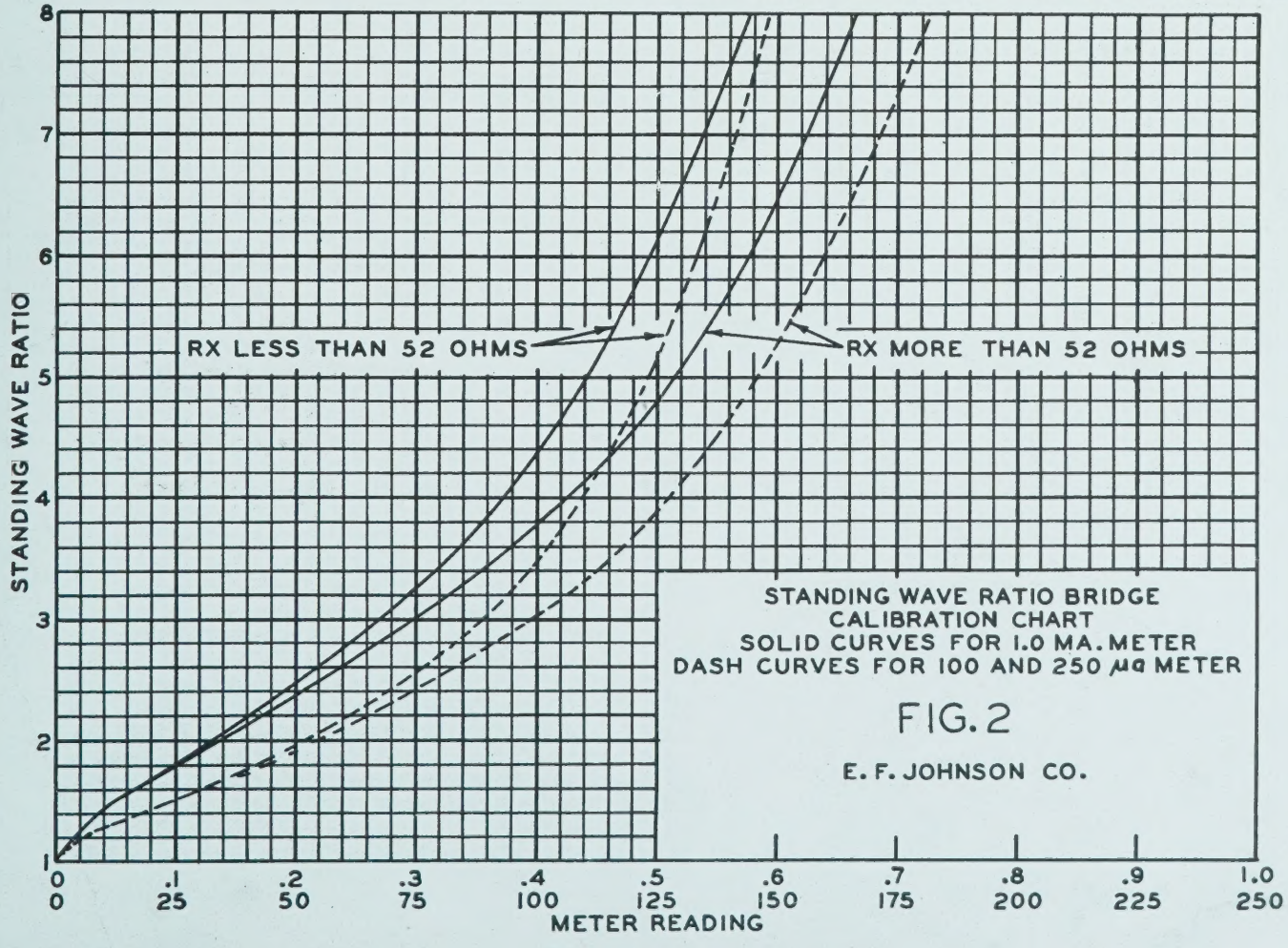

FIG. 2

E. F. JOHNSON CO.

If difficulty is experienced in securing a low enough power level, a resistor load or lamp may be placed across the input to the bridge, preferably at the point of coupling to the transmitter. When the transmitter is a Viking I or II, the low power may be secured directly from the output coaxial fitting by tuning the final amplifier in the usual manner with both coupling controls set at minimum. Before connecting the bridge to the coaxial line from the Viking I or II, turn the drive control to zero and detune the buffer stage. When the bridge is connected, the bridge current may be adjusted by tuning the buffer stage for more or less output.

S. W. R. MEASUREMENT

The unknown impedance (transmission line or antenna) should now be connected to the output terminals of the bridge without disturbing the power input level as determined before. The 0-1 ma. meter will indicate a reduced current value which, when referred to the solid curves of the chart (Fig. 2), will indicate two values of s. w. r. directly.

When the bridge is perfectly balanced, the meter will read zero and the load (transmission line or antenna) can be assumed to be 52 ohms resistance and that the s. w. r. is 1 to 1 indicating a flat line.

If however, the load impedance is greater or less than 52 ohms or if the load contains a component of reactance, the meter will indicate a finite value of s. w. r. The design of the bridge is such that if the load resistance or impedance is greater than 52 ohms the s. w. r. must be read on the lower curve whereas a load impedance of less than 52 ohms must be read on the upper curve for greatest accuracy.

To determine whether the load resistance is greater or less than 52 ohms connect a low value non-inductive resistance (25 ohms or less) between the center terminal of the bridge output coaxial connector and the load terminal previously connected there. The indicated s. w. r. will decrease if the unknown is less than 52 ohms, will increase if the unknown is more than 52 ohms.

Referring to Fig. 2, the pair of curves drawn with solid lines are used when the indicating meter is 0-1 ma., the curves drawn with dashed lines are for 100 to 250 microampere indicating meters. At low values of s. w. r. such as 3 to 1 or less the difference between the two 0-1 ma. curves is negligible and can be ignored. This is also true of the pair of dashed curves for 100 and 250 microampere meters.

S. W. R. MEASUREMENT ON 70 OHM COAXIAL LINES:

To convert the bridge for use with 70 ohm coaxial lines, it is only necessary to replace the two resistors of R3 (Fig. 1.) with two resistors the parallel resistance of which is equal to 70 ohms such as 130 and 150 ohms. It is essential that these resistors be non-inductive and that they be installed in exactly the same manner and position as the orignal resistors so that the coupling between elements of the bridge is not disturbed.

ANTENNA COUPLER ADJUSTMENT:

The JOHNSON SWR Bridge may be used to properly adjust any antenna coupling unit including the Viking "Match-box" coupler. It should be borne in mind that the antenna coupling unit

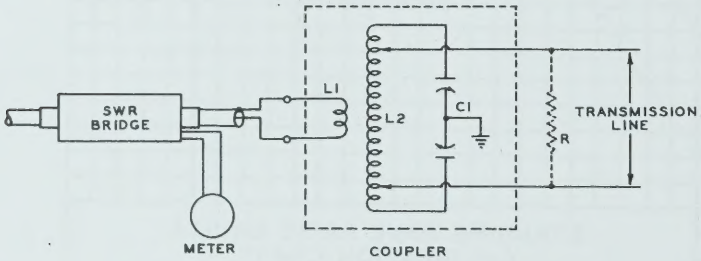

FIG.3

is a device for matching or transforming the antenna system impedance (at the feed point) to the ouptut impedance of the transmitter. The typical coupler illustrated in Fig. 3 is resonant at the operating frequency. The degree of coupling to the transmitter must be adjusted either by L_1 or some means within the transmitter such as a pi-network output circuit, variable link or other variable coupling device. The bridge should be installed between the low power r. f. source of not more than one watt and the coupler input as in Fig. 3.

With the output terminals of the bridge open, adjust for full scale deflection as previously described in these instructions. Connect the coupler to the bridge and connect the antenna transmission line to the coupler. Adjust the coupler until the bridge meter reads zero current which indicates that the antenna transmission line terminal impedance is matched into 52 ohms. If the coupler has a circuit similar to the one shown, the coupler is adjusted to resonance by the tank capacitor C_1 and the impedance matched by the taps on the coil L_2. In some cases where the antenna and transmission line system present large values of reactance to the output terminals of the coupler it will not be possible to attain a good impedance match since the s. w. r. is high. In these cases it is necessary to change the length of the antenna transmission line, or insert reactance of the sign necessary to cancel antenna reactance. The JOHNSON Matchbox coupler is adjusted by two capacitor controls and will handle a large range of antenna resistances and reactances.

S. W. R. MEASUREMENTS OF BALANCED OPEN WIRE TRANSMISSION LINES:

The bridge may be used in conjunction with an antenna coupler to measure the s. w. r. of an open wire transmission line. The coupler performs the transformation of the balanced unknown impedance into an unbalanced impedance suitable for measurement with the bridge.

The bridge is adjusted for full scale deflection with its output terminals open as before. Attach a non-inductive resistor, of the same resistance as the characteristic impedance of the antenna transmission line, across the output terminals of the coupler. (The transmission line is not connected as yet. Adjust the coupler for the lowest null reading of the bridge. This will be zero for a transformation of the load resistance to 52 ohms. (Failure to attain a zero reading indicates inability of the coupler to match the desired impedance.) The coupler must, of course, be capable of tuning to the frequency of measurement. Next, disconnect the resistor and without disturbing the bridge and coupler, attach the transmission line to the coupler output terminals. The bridge meter will indicate a current which, when referred to the chart Fig. 2, will give the s. w. r. present on the line. This does not necessarily represent a ratio of resistances since there may be reactances present on the line where it is connected to the coupler. For accurate measurements, the coupler should be adjusted for each frequency at which a measurement is taken.

MEASUREMENT OF THE RADIATION RESISTANCE OF AN UNBALANCED ANTENNA SUCH AS A VERTICAL RADIATOR:

Measurements must be made at the antenna terminals and not thru a feed line. A variable capacitor and a variable inductor are required for tuning out antenna reactance. Ground the case of the bridge with the shortest possible lead. The bridge is adjusted to full scale meter reading with the output terminal open as before. Connect the antenna to the center contact of J_2 with one of the variable reactances in series with the lead. Using first one reactance then the other, adjust the capacitor or the variable inductor until a minimum bridge reading is obtained. The reactance in the series lead will be equal but of opposite sign to the reactance of the antenna jX_a. If it is possible to measure the inductor or capacitor which produced minimum s. w. r. one may calculate the amount of reactance.

if the capacitor was used, $jX_a = \frac{1}{2\ \pi\ fC}$ and jX_a is **inductive**

if the inductor was used, $jX_a = 2\ \pi\ fL$ and jX_a is **capacitive**

Refer the minimum meter reading to the SWR/Current chart which will give the SWR. In the case of antennas where the antenna resistance is greater than 52 ohms, antenna resistance is equal to the product of the SWR and the standard resistance of 52 ohms (R_a = SWR x 52). If the antenna resistance is less than 52 ohms then antenna resistance is equal to 52 divided by the SWR

$$\left[R = \frac{52}{SWR} \right]$$

As discussed previously, the method of adding a small non-inductive resistor in series with the bridge center output terminal may be used in order to determine whether the impedance is above or below 52 ohms permitting selection of the correct SWR curve.